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INTERNATIONAL INSTITUTE OF AGRICULTURE

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THE INTERNATIONAL INSTITUTE OF AGRICULTURE

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of November and December 1912.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART

ORIGINAL ARTICLES

Reconstitution of Portuguese Vineyards by means of American Stocks.

by

SERTORIO DO MONTE PEREIRA

Professor at the Superior Institute of Agriculture at Lisbon

The cultivation of the vine is still one of the most important and characteristic branches of agriculture in Portugal. Vines are cultivated in every part of the country from the dunes of the coast up to 1 600 ft. above sea level. They occupy an area of about 773 000 acres, and, either gathered in great numbers in contiguous belts or scattered among other crops, they extend over a great part of the whole Portuguese slope which gradually sinks in a south-easterly direction from a height of 6 500 ft. down to the level of the Atlantic. The Portuguese vineyards produce upwards of 154 000 000 gallons of wine, among which are some of the most famous wines of the world: Port, Madeira (1), Muscat of Setubal and *Corcavelles*, besides some excellent table wines such as *Collares*, *Bucellos* and Daõ, and great quantities of wines for blending purposes. The yearly produce of the Portuguese vineyards is worth upwards of 20 000 000 escudos (about £ 4 000 000); it pays 30 000 000 days' work to the vineyard hands and provides the export trade with nearly 22 000 000 gallons of wines of all qualities worth about 8 000 000 escudos (about £1 600 000). This great national asset, now the same that it was before the invasion of phylloxera, has been reconstituted in the period of about 15 years of systematic and effective fighting against the pest, not including the period of the first feeble and hesitating efforts at the commencement of the invasion.

Phylloxera was introduced into Portugal about 1872 by some French stocks planted in a vineyard of *Douro*, the district which produces Pòrt wine.

At first the invasion was slight and not alarming. The surface of the region being very broken and not having much intercourse with the other wine-growing districts, the pest remained for a fairly long time limited to the Douro region.

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(1) In the Island of Madeira. *(Author's note).*

Owing to the indifference with which the vine growers considered the new disease, the State agricultural officials encountered serious difficulties in their first attempts to control it. Up to 1886 the struggle against phylloxera was inefficient and desultory; in some districts the farmers would not believe in a possible destruction of their vineyards and by their incredulity favoured the spread of the pest, carelessly importing infected cuttings and plants and allowing them to circulate freely in the country.

The means of control employed in Portugal were the same as those used everywhere else. Sulphide of carbon was used at first in all treatments, both curative and destructive. On a lesser scale potassium sulpho-carbonate was also used. Several farmers had recourse to flooding, but this process was applied to a limited area, barely reaching 5 000 acres.

To a greater extent planting in sandy soils was practised, and there are still some important vineyards on the sands of the coast and of the interior. The most extensive vineyard of Portugal and of the whole world, belonging to the great agriculturist José Maria des Santos is, for the greatest part of its considerable area — 11 115 acres — situated on sandy soils, and consists of ungrafted vines. This vineyard, which extends along a railway, affords a good demonstration of the efficaciousness of planting on sandy soils. The breaking up of the land before planting the vines, which was done by steam, caused a clayey subsoil to crop up in places near the middle of the vineyard. The first plantation having consisted entirely of ungrafted stocks, the vines planted on the clayey spots died of phylloxera in a short time, thus affording all those who travelled by that railway a convincing demonstration of the resistance to phylloxera of sandy soils, on which the great extent of the green foliage of the vines was barely spotted by the dead vines of the clay patches. This spectacle, however, did not last long because the vines on the clay spots were replaced by American stocks. The land, but slightly undulated, is constituted by very mobile tertiary lands, sometimes quick sands, resting on a clay subsoil over which there is a film of water, which, as is well known, still further increases the resistance of sand against the spreading of phylloxera.

Nevertheless the greatest aids to the reconstitution of the Portuguese vineyards were the American stocks upon which they are almost exclusively based.

In fact if the above mentioned plantations be excepted, namely those *ungrafted* ones that are protected by *flooding* or by their situation on *sandy* soils, it is difficult to find vineyards that are not completely infested by phylloxera in Algarve, the most southern province of the country, from the rest of which it is separated by a mountain range averaging about 2 000 ft. in height, and in the most northern province, Minho, where the vines being trained high resist longer, as is well known, the destructive action of the insect. All this however does not make up an area much above 197 000 acres actually under vines.

The first attempts at reconstituting with American stocks were not successful.

In 1880, M. Laliman, who played an important part in the reconstitution of the French vineyards, delivered a lecture at the Central Society of Agriculture of Portugal and found his audience incredulous and hostile to American stocks.

The want of success which attended the first attempts with American stocks is explained by the scanty knowledge the experimenters possessed of these vines, of the conditions required for their *adaptation* to the various soils, and of their affinity to the varieties of the country. To these reasons must be added the careless use of non-selected stocks and the want of skill in grafting.

The non-selected *Jacquez*, York Madeira, Herbemont, Taylor, and Solonis vines caused the failure of several plantations.

It was only later, towards 1888, when some reconstitutions on a grand scale had succeeded, that the reconstitution movement began to develop.

Already in 1895 the fears of a probable excess of production caused a congress of vine growers to be held at Lisbon! When confidence was reestablished, Portuguese vine-growers, by their initiative, diligence and outlay of capital, gave a great example of energy and of their capacity to act intelligently and rapidly.

With the exception of some errors of *adaptation* and the want of scruples of some nurserymen, it may be said that the reconstitution was perfect and its results excellent.

The present Portuguese vineyards are grafted on the American stocks Riparia and Rupestris and on some hybrids of Aramon Rupestris (Ganzin), Riparia × Rupestris No. 3306 and 3309 (Coudère) and No 101-14 of Millardet.

By far the greater number of Portuguese vineyards include almost exclusively the pure species Riparia and Rupestris in their various forms; Riparias are especially represented by *Riparia gloire de Montpellier* in loamy soils, and the Rupestris by *Rupestris monticola* in heavy clay soils, and by *Rupestris Martin* on the stony and dry hillsides. Some vineyards in moist soils are grafted on Solonis and Solonis × Riparia. Nevertheless the results yielded by Solonis were very uncertain, according to the *forms* employed, and some plantations of Solonis in full vegetation were to be seen by the side of others showing but little vigour, while others again were already dead, according to the greater or lesser honesty of the nurserymen.

The reconstitution on calcareous soils is not a problem of very great importance in Portugal, as soils containing much lime or rich in limestone in a state of minute division occupy a very limited area. Soils with more than 10 per cent of limestone are rare.

Nevertheless on some of these soils Berlandieri and its hybrids with *Vinifera* have been employed. More frequently though, Aramon × Rupestris No. 1 of *Ganzin* and Rupestris Monticola, which possess sufficient resistance for most cases, are to be met with.

American vines as direct producers of grapes have been tried, but only as curiosities. In the Azores some Isabella vines, a variety of Labrusca whose grapes have a foxy taste, are still kept. On the mainland this kind is considered only as ornamental.

The adoption of American vines modified profoundly the cultivation of the vine in Portugal.

The first effect has been to change the situation of the vineyards, which formerly were located on the hill slopes in dry and poor soils. Now the vineyards have descended to the plains or kept to the slightly sloping ground where the soil is deep.

Some of the most fertile plains of the country, like that of Ribatejo, have been planted to vines on a great scale. Besides the greater needs of American vines as regards depth of soil and the depth to which the latter has to be broken up, the change in economical conditions has avoured this displacement of the Portuguese vineyards, which at first lost something in the quality of their produce but gained much in intensity of production.

Grafting, which was rendered necessary by the use of American stocks, contributed also to the increase of production, and by requiring greater care to be taken in the cultivation of the vine brought about a great improvement in cultural methods. The graft most used was cleft-grafting and frequently also whip-grafting in plantations made with American cuttings; inarching was used only in nurseries.

From the preliminary breaking up of the soil up to the vintage it may be said that all operations connected with the vines have been influenced by the introduction of American stocks. The soil was worked to a greater depth and more thoroughly. Preparatory and cultural improvements, which formerly were compratively rare, became common practices. The use of artificial fertilizers, nitrogenous, phosphatic and even potassic, notwithstanding the fact that Portuguese soils are frequently rich in potash, became general.

The vines were planted further apart, and instead of being placed always in rows or squares, they were planted to a great extent in quincunxes. The average distance between the vines, formerly 3 ft. 3 in. to 4 ft. 9 in., has often been increased to 6 ft. 6 in.

Hoeing has became a current practice.

The system of pruning the canes known as Guyot's, though it is of Portuguese origin and has been practised from remote periods in the Douro region, has become general throughout the country; the old system of pruning is still followed in the great vineyards of Ribatejo and in the plains, with the only object of saving expense.

As for the vintage, more care than formerly is bestowed on fixing the time of gathering the grapes, on their selection and transport. Even in wine-making an improvement has taken place since the appearance of phylloxera.

In conclusion, it may be said that if the invasion of phylloxera has been a calamity, all the sacrifices which it has entailed have been compensated by the improvement and intensity of the present production and by its increased value.

Neither vine-growing nor wine-making in Portugal has anything to fear from comparisons with the same industries in any other country.

Portuguese viticulture as it is at present reconstituted, is still expanding, and bears witness, by the excellent results it has achieved, to the value of American stocks and of the modern technical processes of vine-growing and of wine-making.

The Recent Development of Cattle Breeding in Germany.

BY

Privy Councillor, Professor Dr. HANSEN, Königsberg, Prussia.

Owing to the expansion of trade throughout the world and to the development of flourishing industries, German agriculture underwent far-reaching changes during the second half of the last century. While the prices of grain have at times fallen considerably and are now again moderately rising, the prices of animal products have uninterruptedly followed an ascending course. A population continually growing in numbers and in prosperity was inclined and able to increase to a great extent its consumption of animal products. It was thus that German farmers found in the rearing of live stock at least a partial compensation for the loss of their prospective profits on grain-growing.

Of course the single branches of live stock keeping were each of them differently affected by the altered economic conditions. The breeding of sheep, which had been carried on chiefly for the production of wool, was struck hard by the cheap colonial wool that invaded European markets, and the gradually increasing prices of meat were not sufficient to make good the deficiency. It is true that a gradual change in the breeds of sheep kept had begun; namely from those producing only wool to those yielding wool and meat and even only the latter; still the number of sheep in Germany has fallen to a quarter of what it was in the sixties of last century, and, notwithstanding the better prices for wool, this movement has not yet ceased. On the other hand, notwithstanding the notable extension of railways and the recent diffusion of the motor-car industry, the number of horses has increased at a fairly uniform rate. From 3.19 millions in the early sixties the number has risen to 4.35 millions in 1907, that is in the ratio of 100 to 136. The number of goats has also considerably increased, having risen in the same period from 1.82 millions to 3.53 millions, or as 100 to 194, and still greater is the increase in the number of pigs, which in 1861 was 6.46 millions and in 1907, 22.15 millions, that is in the ratio of 100 to 343.

The development of cattle breeding was not so striking. The much greater weight of the animals and their consequently greater food requirements, their slower growth and the longer life of the individual animals, which is not determined, as with pigs, only by the production of flesh, but extends over years for the production of milk and of muscular energy, rendered a rapid increase in the number of head impossible. Nevertheless the figures show considerable progress. The census for the whole German empire give the following returns:

	Head of Cattle	
1861	14 999 194	
1873	15 776 702	+ 5.2 per cent.
1883	15 786 764	+ 0.1 „
1892	17 555 834	+ 11.2 „
1900	18 939 692	+ 7.9 „
1907	20 630 544	+ 8.9 „

At first, during the above period the increase was not much, but after the eighties it grew considerably. The returns of the census taken at long intervals of time for the whole of the German Empire show the increase in the number of cattle even during recent years to have been fairly uniform. In reality, however, such was not the case, for the development was irregular, as is proved by the yearly enumerations made since 1907 in the largest cities of the German Federation and in the Kingdom of Prussia.

In Prussia the head of cattle were:

In	1900	10 876 972	
	1902	10 405 769	— 4 33 per cent
	1904	11 156 133	+ 7.21 „
	1906	11 646 908	+ 4.40 „
	1907	12 011 584	+ 3 13 „
	1908	12 089 072	+ 0.65 „
	1909	11 763 161	— 2.70 „
	1910	11 592 521	— 1.45 „
	1911	11 662 234	+ 0 77 „

In the years 1902, 1909 and 1910 the number of cattle diminished. This was due to scanty forage crops and partly also to diseases. It is remarkable however that in 1911, during which year both the above mentioned adverse conditions obtained, a slight increase took place. This is the best proof that endeavours are being made in every way to increase the stock of cattle.

On each square mile of total area there were in 1873, 75.9 head of cattle, in 1892, 84.5 and in 1907, 99.1. With the increase of the population of the German Empire the number of animals has not quite kept pace. To every 100 inhabitants there were in 1873, 38.4 head of cattle, in 1892, 36.5 and in 1907, 33.0. It would however be erroneous to conclude that the present stock of cattle yielded less per inhabitant than it did in the seventies of last century. During this period not only have cattle grown in number but also, owing to better feeding and better breeding, they have much improved in precocity, live and dead weight, in milk yield and consequently also in value. In regard to live weight and value, valuations were made in connection with the returns for 1883, 1892 and 1900, according to which the live weight increased between 1883 and 1900 from 100 to 132 and the value from 100 to 136, whilst the number of head increased only from 100 to 120. In other words, one average head of all age-classes weighed in 1883, 706.2 lb. and in 1900, 774.4 lb., which amounts to an increase of 10 per cent. in the live weight, and about the same in the yield. There is no doubt that the dead weight has increased in a higher degree. The greater precocity which leads to a younger stock and to a quicker sale of fattened cattle may be so far translated into figures as the proportion of cattle of the younger age-classes constitutes now a greater proportion of the total stock than formerly. It means a more rapid sale and this of animals possessing a higher dead weight. It has been calculated that in the last thirty years the production of beef and of veal has increased by 60 per cent. The greater number of cows, and further the improved milk yield of the individual cows, has also led to a higher production of milk. Though the assumption that the amount of milk produced in Germany has doubled since the seventies may be disputed, there can be no doubt that *the increase in the quantity of food stuffs produced by cattle rearing has sensibly outstripped the rise in the numbers of the population.*

As regards the distribution of the stock of cattle according to the acreage of the farms, and the changes that have taken place in this respect during the last 25 years, the following table showing the figures for the Kingdom of Prussia, gives a fair idea.

Farm	Acreage	Percentage		On 100 acres of cultivated area the number of head of cattle was in:		
		of cultivated area	of stock of cattle	1882	1907	1882=100
Cottagers	up to 5 acres	1.71	6.63	30.7	41.2	134.2
Small peasants' farms	5 to 12 ½	6.34	13.06	25.5	27.5	107.9
Medium " "	12 ½ to 50	27.66	33.96	16.2	21.0	126.8
Large " "	50 to 250	32.90	29.69	12.1	15.8	130.0
Large estates	250 and upwards	31.39	16.66	5.6	9.7	171.4

For the whole German Empire the conditions are very nearly the same; of the whole stock of cattle, 6.6 per cent. is held by cottagers, while peasant farmers with farms ranging from 5 to 250 acres possess 81.8 per cent. and the large estates only 11.6 per cent., or much less than in Prussia. In proportion to the acreage the number of cattle diminishes with the extent of the farm. In this respect it is to be observed that the increase of cattle in large estates has quite recently become considerable. This is due in the first place to the tendency to fill up the gap caused by the cessation or limitation of sheep rearing.

With the object of raising cattle breeding to its present level and to further it still more, great efforts have been made both by public bodies and by private persons. The activity of the Imperial Government is principally directed, besides to political and economical measures, to the control of plagues and diseases, in which a suitable protection of the frontiers is no mean part. The immediate measures for promoting cattle breeding are left to the individual States and to the special representative bodies. For the whole of Germany the figures are lacking, but Prussia has set apart, in the year 1910, a sum of a million marks, in round numbers (about £50 000), for the benefit of cattle breeding alone. Some of the other States of the Federation have in proportion to their area allotted still higher sums. On the means employed the following information will be of interest.

The choosing of bulls for breeding purposes by officials has been introduced with but few exceptions into the whole of Germany. For providing bulls for breeding purposes the South German States have followed the example of Baden and possess communal bull stations (*Gemeindestierhaltungen*) which, especially for small holdings, have been most beneficial. In North Germany there are the bull stations (*Bullenstationen*), which by means of the Chambers of Agriculture provide good bulls from funds loaned by the State without interest. These stations may be considered as the forerunners of the breeding associations, also inasmuch as they prepare the way for a certain unity in the trend of breeding. For the supply of male animals for breeding purposes there exist in several localities rearing stations, breeding-cattle farms and pedigree herds, which in part prepare bulls by suitably rearing young males bought for the purpose and in part they breed them themselves. Pedigree females are also sometimes bred, but not so frequently.

Recently a far-reaching influence in promoting breeding has been exerted by the breeding societies or breeding cooperative associations, often called herdbook associations. They depend upon private initiative and extend over areas of very different extent, in some cases over a whole province, in others over only a district. Often several small cooperative associations are united into a federation. The breeding associations deal only with the improvement of one breed, for which purity of breed is always the object aimed at, notwithstanding that sometimes recourse is had to crossing. One of the most essential tasks of the breeding associations is the collection of pedigrees, which are entered in the herdbook and published. On principle every animal, male or female, must be approved by specially appointed officials before being entered.

Recent researches have shown, in all branches of breeding, that there are always some few animals that stamp their characters upon a breed in which their blood flows. The use of the best blood, with a definite object in view, holds out to the breeding industry the most promising prospect, and will greatly facilitate bringing about uniformity in the animals of the various races. The activity of the breeding associations extends to every measure that tends to improve breeding. Thus, bull stations are established;

the use of valuable breeding animals is ensured for a length of time by means of maintenance prizes; exhibitions and distribution of prizes are held; performance records are kept; pastures for young animals are prepared; plagues and diseases are controlled; the sale of breeding animals is organized by means of markets and auctions. One or more of these measures is adopted according to local conditions. The breeding associations have attained at present a highly flourishing condition under the influence of the German Agricultural Society (*Deutsche Landwirtschafts Gesellschaft*) which supervises their activity and "recognizes" them when they satisfy certain conditions, thus entitling them to exhibit at the great shows held every year in another place. In 1911 there were in Germany, for cattle alone, 1051 breeding associations. Under their influence systematic breeding of certain races has arisen; in several parts of Germany its further development has been much assisted by the inspectors of breeding who have been charged with the professional oversight of the work.

Every year numbers of shows are held and prizes given, both local and district shows as well as provincial and national. The most important is the great German exhibition of the *Deutsche Landwirtschafts Gesellschaft*, which is held every year in turn in the various provinces, and which has powerfully stimulated all branches of German agriculture, including cattle breeding. Most of the shows are reserved to animals kept for breeding purposes; occasionally fat cattle shows are also held.

Besides the above mentioned aids tc breeding, there are also the performance records, which, especially for milk, have been established chiefly in the North of Germany on the lines of the Danish control associations. Their number to-day is about 500. They record, with the assistance of a special employé (control assistant), the yield of milk according to quantity and to fat content and ascertain at the same time the consumption of food for each cow. They have given a firmer basis to selection for breeding and have improved the feeding. The best cows have been recognized and their offspring, both male and female, has been reared. Further the proper use of concentrated foods according to the milk yield has been learned. Thanks to these control associations, the keeping of cattle has become more profitable.

From the above it will be seen that in Germany much importance is attached to the improvement of cattle breeding, for the attainment of which object ample means are provided and great efforts are made. Much still doubtless remains to be done, but it cannot be denied that a wholesome progress has been achieved and great hopes may be entertained for the future.

Measures adopted in Switzerland for the Introduction of Agricultural Book-keeping into the Peasants' Farms.

by

Professor Dr. ERNEST LAUR, of Zürich - Brugg.

During the last fifty years agriculture has made enormous progress. It has not only developed its technique in a high degree, but it has also adapted itself to the new economical conditions. While for many years farming measured its production only by the standards of its own wants, it has been forced by the general evolution of the world to wake up from its apathy, to introduce radical modifications in its systems and thenceforward to dispose of its produce on the great markets. It is thus that in a certain sense farming has come to resemble commercial and industrial enterprises. But whilst in these the principles of book-keeping have been adopted as the basis of their activity, and carelessly kept accounts are considered as a proof of a want of sense, and may in some cases fall under the rigours of the law, the great majority of farmers, even to this day, think that they can farm profitably without availing themselves of the guidance afforded by book-keeping.

This opinion is decidedly harmful to farming. Not only does it cause losses by the absence of the means of control, or by the introduction of measures that do not answer to the objects aimed at, but it is responsible on the one hand for the exaggerated prices paid for land and farms, and on the other for the low prices taken for the produce, which often do not cover the cost of production.

It is not rare to find that farmers do not know the rate of interest that the capital engaged in their farm is bearing; moreover, through lack of book-keeping, they are not in a position to say what prices their produce should command so as to cover the cost of production.

In order to remedy this state of things, far-sighted men have for a long time past been endeavouring to popularise the principles of book-keeping among the farming classes, but without however having succeeded in introducing them into general practice. It is therefore a matter for rejoicing that in Switzerland a number of peasant farmers have been gained over to the idea and now keep their accounts under the control of a central Bureau, The work done in this connection by the Swiss Peasants' Secretariat has attracted the attention of numerous agricultural circles, and other countries have been stimulated to convert their farmers to these ideas. In Germany, especially, where the introduction of the income tax has caused the want of properly kept accounts to be keenly felt, the endeavours made with the object of introducing book-keeping into the practice of farming have been greatly facilitated.

In Switzerland the success which has attended the researches on the profitableness of farming is mainly due to the adoption of the following principles:

1. Selection of a system of book-keeping which spares the farmer unnecessary writing, but which enables him to balance his accounts correctly.

2. Uniform instruction for the accountants, who must engage themselves by an agreement to keep their books.

3. The balancing of the books to be done by a Central Office.

4. Comparative examination of the figures and use of the results in the study of questions connected with political economy and with the science of farming.

We shall endeavour to give a brief account of the way in which these researches have been organized in Switzerland.

1. *The system of book-keeping*: The various systems of book-keeping used by farmers may be divided into two distinct groups, on the one hand those which only determine the net returns *of the property as a whole*, on the other those which determine the profitableness of each of the different branches of the farm. The former of these methods is the one that has been adopted in Switzerland. It does not entail upon the farmer the work of following the exchange of values in the interior of the farm. It simply sets forth what the farm disposes of to third parties and what it gets from them, and shows at the end of the year in what manner the amount of its capital has changed from what it was at the beginning of the same period. Nevertheless, under the term "third parties" the farmer and his family are included, in connection both with eventual accessory undertakings and with consumption. As this latter is often connected with that of the salaried hands, the common household is also considered as a third party. This system of book-keeping is therefore based on four accounts: *Farm, Household, Accessory Undertakings, Consumption.* The household account only plays the part of intermediary, and the expenses which it bears at the end of the year are distributed among the other three accounts in proportion to the number of persons maintained.

These four accounts must embrace the totality of the components of the farmers' capital, as well as all the income and outlay of money. The exchange in kind taking place between these accounts must also be determined, but not particularly within each account. In order to attain this object the farmer must draw up an *inventory* at the begining and end of each year and must also keep a *cash account* and enter in a *housekeeping book* the exchange in kind between the several accounts. A personal account current will complete this system of book-keeping, which allows the gross returns and expenses, the net income, the value of the farmer's labour, the interest his capital has produced, his household expenses and consumption, and the changes that his capital has undergone, to be known.

2. *Organization of the investigations.* In order to induce farmers to take part in them, the courses of book-keeping are announced by the agricultural press and by some of the political papers. The candidates are not admitted to the course unless they engage themselves *by agreement* to keep the accounts of their farm for at least one year, and to submit their books to be audited by the Secretariat, which examines them also as to the profitableness of the farm. The candidates then take part in a three days' course for which all their travelling and living expenses are reimbursed and the necessary material, such as forms, etc., supplied free of charge. Besides this, when they give up their accounts they get an artistically designed diploma and a prize of 30 francs (about 24 shillings). Those farmers who, after having taken part in the course fail to keep their engagement, have to reimburse the Secretariat all expenses incurred on their behalf. It is to a great extent due to these measures that the majority of accountants submit their books to the Secretariat. With the object of encouraging farmers to continue keeping their books in the following years, the Secretariat supplies them with the requisite material and undertakes to balance their accounts for them. Those who for ten years have submitted their accounts to the control of the Secretariat are rewarded with a wine-cup with an inscription engraved on its silver mounting, and their names are published. During the course of the first year each book-keeper is visited by an employé of the Secretariat who checks the books, especially the inventory, draws up, on a uniform plan, a brief description of the farm, discusses and settles all questions likely to present difficulties, such as deciding on the amount of retribution to be assigned to the farmer and to his family, or distributing the rent of the buildings, etc. The expenses of these researches, including the work done by the Secretariat, amount on average to 100 fr. (about £4) per annum per farm.

3. *Closing the accounts.* — The accurate closing of the accounts of a farm is a more complicated affair than the same operation in a commercial business. The causes of this are, besides the difficulties encountered in questions concerning valuations, the intimate connection existing between production and consumption. The consequence is that if the use of book-keeping is to spread among peasant farmers, it can only be possible on condition that the closing of accounts be entrusted to a Central Office and not to the farmers themselves. This principle has been adopted in Switzerland, and the Peasants' Secretariat closes all the accounts. Two methods are followed: one, the *simple closing*, shows only the net returns and the income of the farms and of the accessory enterprises; the other, the *amplified closing of accounts*, also examines separately the various items of the gross revenue and of the expenses, without however doing the same for the net returns. The farmer receives only the simple closing of accounts. The two methods are a control on each other.

4. *Examination of results.* — The results of these books are submitted to methodical examination. The researches bear on the amounts of capital employed, on the outlay for labour and the other working expenses, as well as on the gross and net returns and on the income; the consumption is also examined. By means of these investigations knowledge is gained as to the influence which the extent of the farms, the manner of utilizing the soil and the kind of farming have upon the produce destined for the market, upon the intensity of the farm, etc. The figures obtained every year form the matter for new groups and thus the changes happening in the course of several years may be followed and observed.

Some of the principal results are given here below:

Years	Number of accounts closed	Expenses per acre	Gross revenue per acre	Net returns		Interest on capital per cent.	Remuneration of labour per work-day and per head	Farming income (interest and remuneration of labour) per work day and per head	Household expenses per day and per head
				per acre	per cent.				
		£ s. d.	£ s. d.	£ s. d.			s. d.	s. d.	s. d.
1901	110	6-10- 4.5	8- 0- 7.3	1-10- 3.2	1.94	0.82	11.3	2- 3.8	11.5
1902	58	6-14- 8.6	8-19- 2.4	2- 4- 5.8	3.28	2.86	—	3- 1.1	—
1903	137	7-13- 9.5	10- 5- 8.4	2-11-10.8	3.63	3.29	1-11.1	3- 3.0	11.9
1904	175	6-17- 9.5	9- 7- 3.0	2- 9- 5.0	3.21	2.57	1- 5.1	2-10.1	11.9
1905	204	7-12- 3.2	10- 2- 0.7	2- 9- 9.5	3.27	2.90	1- 7.1	3- 1.6	1- 0.4
1906	230	7- 8- 1.6	10- 7- 0.5	2-18-10.9	3.75	3.77	2- 0.8	3- 3.1	1- 0.8
1907	250	7- 4- 7.7	10-10- 4.2	3- 5- 8.5	4.02	4.22	2- 1.1	3- 4.5	1- 1.1
1908	287	7-18- 0.2	11- 0- 7.9	3- 2- 7.6	8.78	4.45	2- 4.8	3- 7.2	1- 1.6
1909	276	8-10- 6.8	11- 6-10.8	2-16- 4.0	3.31	3.01	2- 2.6	3- 5.4	1- 1.9
1910	270	8-15- 6.4	11-16- 3.6	3- 0- 5.4	3.71	3.68	2- 8.8	3-11.1	1- 2.3
1911	283	9- 4-10.4	12- 5- 6.8	3- 0- 8.4	3.65	3.49	2- 9.7	3-11.1	1- 2.6
Average 1901–05	*684*	*7- 3- 8.8*	*9- 8-10.8*	*2- 5- 2.0*	*3.11*	*2.46*	*1- 6.1*	*2-11.1*	*11.9*
» *1906–11*	*1596*	*8- 3- 7.4*	*11- 4- 5.5*	*3- 0-10.1*	*3.70*	*3.77*	*2- 4.8*	*3- 7.2*	*1- 1.7*
» *1901–11*	*2280*	*7-16- 7.3*	*10-10- 4.1*	*2-13- 8.6*	*3.41*	*3.19*	*2- 0.5*	*3- 3.5*	*1- 1.0*

SECOND PART

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

1 - Decree approving the Regulation of the Brazilian Government Stations of Sericulture.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Actos do poder executivo. Decreto N. 9671 de 17 Julho 1912. — *Boletim do Ministerio da Agricultura, Industria e Commercio*, Year I, No 3, pp. 11-16. Rio de Janeiro, 1912

The Decree No. 9671, of July 17, 1912 approves the Regulations of the Sericulture Stations created in conformity with Law No. 2544 of January 4, 1912, and enacts that the object of the Sericulture Stations is to study experimentally all the factors of the production of silk, so as to be in a position to provide farmers with precise data for the improvement of the methods of silkworm rearing.

The Stations are charged with the following duties :

1. — The study of all the conditions that are essential to the success of silkworm rearing.

2. — The study of the causes of epidemics and of the most efficient means of control.

3. — Carrying out experimental silkworm rearing with the object of producing silkworm eggs to be used in their turn for the prodution of other eggs.

4. — The production, selection, preparation and distribution to farmers of good silkworm eggs.

5. — The gratuitous microscopical examination of silkworm eggs, larvae, chrysalides, etc., at the request of persons interested in silkworms.

6. — The cultivation, and distribution to farmers, of varieties of mulberries adapted to the various localities.

7. — Testing new species of silk cocoons and new apparatus for rearing.

8. — Answering questions connected with sericulture.

9. — Practical study of the industrial utilization of the products of sericulture.

10. — Spreading by means of books and lectures, the improved methods of sericulture.

11. — Surveillance of the process of silk rearing and advising as to the best means of improving it.

12. — Promoting the institution of silk factories.

13. — Spreading practical instruction in silk spinning and weaving.

The stations of sericulture shall not limit their activity to the study of the silkworm, but shall extend it also to silk, its preparation, properties and various uses. They are to be provided with buildings, laboratories, workshops, and cold storage chambers, in which to rear silkworms and impart practical instruction, and further with an experimental mulberry plantation to supply the necessary food for the worms Two practical courses shall be held every year, one, lasting three months, for men, and one of one month for women.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

2 - The Position and Condition of the Prussian Rural Continuation Schools during the Financial Year 1911.

Stand und Verhaltnisse der preussischen landlichen Fortbildungs-schulen im Rechnungs Jahre 1911. — *Zeitschrift fur das landliche Fortbildungsschulwesen in Preussen* (1), Part I. 1912-13, pp. 1-19. Berlin, October 1912.

In the year 1911, there were in the Kingdom of Prussia 5349 Rural Continuation Schools. Of these, 230 were established by districts (Kreise), 3904 by parishes (Gemeinde), 43 by Agricultural Associations, and 1172 by private individuals and other agencies. The expenses of the schools were defrayed : in the case of 15 by the districts alone, in that of 21 by the parishes alone, while one was supported by Agricultural Associations, 1187 solely by means of State contributions, 3973 by the State in conjunction with other interested parties, and 149 by private individuals and other agencies. The number of self-supporting schools was 3. The expenses, excluding upkeep, heating, lighting and cleaning of the school-buildings, amounted to £42 454. This expenditure was met by : £1855 derived from fees, while private individuals and institutions furnished £1432, Agricultural Associations £112, districts £4594, parishes £5438, Provinces £308 and the State £28715. The number of pupils was 86 689 and that of the teachers 7554; of which 354 were ministers of religion, 4 agricultural teachers, 7135 teachers in the elementary schools and 61 other persons. Instruction was given only during the winter in 5298 schools, and only 51 were open throughout the year. There were in 1911 761 more schools than in 1910.

Since 1896, the number of Rural Continuation Schools has increased : from to 570 in the Province of East Prussia, in that of West Prussia from 9 to 206 ; in the Province of Brandenburg from 1 to 310 ; in Pomerania from 3 to 233 ; in Posen from 22 to 566 : in Silesia from 29 to 715 ; in Saxony from 43 to 211 ; in Schleswig-Holstein from 50 to 224 ; in Hanover from 138 to 711 ; in Westphalia from 15 to 280 ; in Hesse-Nassau from 325 to 874 ; in the Rhine Province from 244 to 293; in the Hohenzollern province from 51 to 56; in the whole State of Prussia from 930 to 5349. The total number of scholars rose in the same time from 13307 to 86689; the average number of students per school rose from 14.3 in 1896 to 16.2 in 1911. In the Provinces of Silesia, Hanover and Hesse-Nassau most of the school-attendance was compulsory, which accounts for the extraordinary increase in the scholars in those districts.

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(1) Rural Continuation Schools are schools in which, chiefly in the winter months, instruction is given to the country youths (13-20 years of age) according to a fixed curriculum similar to that in force in the primary schools, special attention being given to agricultural subjects.

3 - **Standardization of Instruction in Forestry in the United-States.**

Report of the Committee of the Conference of Forest Schools. — *Forestry Quarterly*, Vol. X, No. 3, pp. 341-304 Ithaca, N. Y., 1912.

Within the last decade the number of forest schools in the United States has increased with remarkable rapidity. To-day there are 24 institutions which give courses leading to a degree in forestry, and about 40 others which include forestry in their curriculum. Over 500 young men are preparing themselves in these schools for forestry as a profession.

Within the last few years, it has been felt more and more that with the large number of forest schools there is a danger of lowering standards, and that it is desirable to attempt a standardization of forestry education.

The first step towards such standardization was brought about in December 1909, on the initiative of Gifford Pinchot, who called a conference of forest schools to consider the aim, scope, grade and length of curriculum. At this conference a committee was appointed to draw up a plan for the standardization of the requirements for technical training in forestry. There were appointed on this committee Henry S. Graves (chairman), B. E. Fernow, R. T. Fisher, Gifford Pinchot and Filibert Roth. The committee formulated provisionally a standard for forestry education, and called a second conference of forest schools in December 1911, in Washington, to consider its report.

The following institutions were represented at this conference: Yale University, Harvard University, University of Minnesota, Michigan Agricultural College, Massachusetts Agricultural College, New Hampshire College, University of Maine, University of Missouri, Iowa State University, University of Nebraska, University of Washington, Ohio State University, Syracuse University, Pennsylvania State College, Pennsylvania State Forest Academy, and University of Toronto, Canada.

The provisional plan of the committee was discussed in detail by the conference and an expression of opinion by majority vote obtained as to requirements for admission, the courses to be given in the curriculum, and the number of hours for each course.

The need for at least four different grades of training has been recognized.

I. Advanced professional training to include not only a substantial general education but also a well rounded course in all branches of technical forestry.

II. Instruction for Forest Rangers, requiring merely a common school education and conducted mainly along thoroughly practical lines.

III. General instruction in forestry supplementary to a course in agriculture, and designed to assist owners in the handling of their own woodlands.

IV. General course in conservation and forestry designed for those who wish, as a part of their general education, to have some information on the economic problems involved.

The work of the Educational Conference held on December 28-29, 1911 was confined exclusively to formulating the requirements of the high grade professional course, and this report, therefore, deals exclusively with the standardization of a course for advanced professional training.

The Committee has recognized at the start that there is a constantly growing need for specialists in forest work of three distinct types, besides general practitioners namely:

1) Foresters who have specialized chiefly along the lines of either forest management, or forest planting, or forest valuation or similar technical problems; 2) forest engineers; and 3) forest technologists. To develop specialists along these three lines within four years of college work is an impossibility. Therefore the scope of the courses considered in this Report has in view a well-balanced professional school which does not aim at great specialization in any of these three lines of work, but attempts to give a general knowledge of the principles which underlie the entire field of the forester's activities, leaving the acquisition of specialized knowledge to be gained by the students after graduation.

The technical courses considered essential in a high grade school and the number of hours accepted by the Educational Conference as the minimum time to be devoted to each course are given in the following schedule:

Subject	Hours		
	Class Work	Field or Laboratory	Total
Dendrology, Forest Geography . . .	60	66	125
Silvics and Silviculture	100	250	350
Tree Diseases	20	30	50
Forest Entomology	20	30	50
Forest Protection	20	with management	20
Forest Mensuration	40	100	140
Forest Management: Finance - Regulation - Working Plans	70	150	220
Forest Utilization:			
Lumbering-Engineering	90	190	280
Forest Products:			
Timber Physics - Wood Technology.	50	100	150
Forestry History	20	—	20
Forestry Economics:			
Forest Policy - Forest Administration	95	—	95
	585	915	1 500

An attempt has been made in this report to describe at some length the scope of each course, outlining, at least for the most important courses in forestry, the fields which are to be covered in them.

But it is not the intention of the Committee to force the adoption of these exact outlines, since there is a full appreciation that on account of the personnel of the teaching staff and other practical considerations, there must be considerable latitude left to each school to arrange its course in such a way as to meet its special needs and use its particular facilities.

4 - Instruction in Cold Storage Methods in France in 1912-1913.

L'enseignement frigorifique en France en 1912-1913. — *La Revue Générale du Froid*, Year 4, Vol. IV, No. 11, pp. 607-609. Paris, November 1912.

In 1912-1913 the following courses of instruction in cold storage methods will be held in France.

1. — Course given by M M. Marchis and Maillard at the Higher School of Aeronautics and of Mechanical Construction of Paris. 2. — Evening course held by M. Blanchet at the Philotechnical Association of Paris. 3. — Course held at the Central School of Arts and Manufactures of Paris. 4. — M. Jules Henriet's course at the Marseilles Polytechnic Association.

The instruction in the first course is directed to satisfy the requirements of the examination for the diploma of Cold Storage Engineer given by the French Cold Storage Association.

For detailed programmes see the original publication.

5 - An Enquiry into the Condition of Association in Swiss Agriculture.

Enquête sur l'état de l'Association dans l'Agriculture Suisse. — *Exposé du Secrétariat suisse des paysans*, No. 44, pp. 1-138. Berne, 1912.

The enquiry made by the Swiss Peasants' Secretariat for the purpose of determining the number of Agricultural Associations, Syndicates, Corporations, Societies and Leagues, together with their aims and the number of their members, extends to the whole of Switzerland.

According to this enquiry, the latter country possesses 6230 local associations. The number of the members has been ascertained in the case of 6065 of these (97.3 per cent.) and amounts to 293 719; on adding to this figure, the members of the 95 cantonal, intercantonal, and national organisations, the actual number of members belonging to the agricultural associations of Switzerland is 380 129. There are in Switzerland, in addition to the " Union suisse des paysans ", 81 cantonal, intercantonal and national organisations formed by the Union of Associations; these possess a total of indirectly attached members amounting, according to this enquiry, to 346 225; on adding the 144 377 members of the Union suisse des paysans, a total of 870 731 persons affiliated to Agricultural organisations in Switzerland is obtained.

The following table has been drawn up for the purpose of classifying the different associations according to their aims:

Kind of Association	Number of Associations			Actual No. of Members
	Total	Having given list of their members		
		Number	Per cent.	
1. Agricultural Associations	856	841	98.3	266 876
2. Agricultural Cooperative Societies . .	567	561	99.0	105 728
3. Dairy Associations	2 819	2 766	98.1	140 471
4. Breeding Syndicates	1 293	1 268	98.1	78 904
5. Fruit-growing Associations	80	78	97.5	9 326
6. Vine growing Associations	57	55	96.5	4 986
7. Threshing Associations	133	129	96.9	3 946
8. Distilling Associations	53	51	96.2	974
9. Associations of Mills and Bakeries . .	42	41	97.2	6 447
10. Associations for Improvements, Draining and Irrigation	73	69	94.5	3 628
11. Associations of Alpine Economy. . .	233	183	78.5	11 167
12. Agricultural and Horticultural Associations	15	15	100.0	1 874
13. Associations of Agricultural Credit . .	145	145	100.0	18 636
14. Agricultural Insurance Associations .	41	39	95.1	73 391
15. "Union suisse des paysans"	1	1	100.0	144 377
Total . . .	6 408	6 242	97.4	870 731

Switzerland possesses, according to the census of Aug. 9,1905, a total of 243 710 farms of which the soil is cultivated; this gives a coefficient of representation for each farm of 3.56 for the associations with directly attached members, together with those composed of sections; and a coefficient of 1.55 for the associations possessing only directly attached members. Since many cases occur in which one person is a member of several associations, it is impossible to say exactly how many of the farmers belong to agricultural associations, and how many are not members of these bodies.

6 - Proceedings of the Sixteenth Annual Meeting of the American Association of Farmers' Institute Workers.

BEAL, W. H. and HAMILTON, JOHN: *U. S. Department of Agriculture: Office of Experiment Stations, Bulletin* 251, 75 pp. Washington, September 18, 1912.

At the sixteenth annual meeting of the American Association of Farmers' Institute Workers, the Committee on institute organization and methods presented a report in which some statistics are given which indicate the vastness of the farmers' institute work now being undertaken in America.

During the fiscal year ending in November 1911, there were held in the United States 16 741 sessions of regular farmers' institutes. These were made up of 3539 one-day meetings, 1942 two-day meetings, and 172 three or more day meetings, representing 7935 days of farmers' institute work. The attendance reported at all institutes was 2 412 600 persons. Attendance upon agricultural trains 995 220. The appropriation from all sources of support for the farmers' institutes was $ 445 193.

In many States three or more forms of instruction in agriculture and domestic economy are now being supplied the people outside the college walls, namely 1) the farmers' institute proper, 2) the operation of agricultural trains, 3) the conducting of demonstrations, 4) the holding of six-day schools or campaigns, 5) the organization of boys' and girls' clubs, 6) the establishment of the woman's auxiliary as a special feature of the institute work. The farmers' institute proper is but one phase of the general extension movement.

Fundamentally, the farmers' institute is not by nature a well-disciplined school consisting of teacher and taught. Instruction here assumes the form of positive statements, the declaration of established principles and the presentation of material facts of value to the producers of the country.

A successful farmers' institute must accomplish at least four things: 1) yield practical information to those having agricultural problems to solve; 2) more clearly define the farm problems of a community; 3) widen the circle of institute interest and influence; and 4) leave a permanent local organization, club, or institute that stands for agricultural progress.

Thirty-five States have recognized the importance of the farmers' institute work by providing specific appropriations for State support. The amount so appropriated for the past fiscal year aggregated $ 372 430.

7 - International Exhibition of Import and Export Products in Barcelona, Spain, from April 28 to July 2, 1913.

AGRICULTURAL SHOWS AND CONGRESSES

Daily Consular and Trade Reports, 15th Year, No. 232, pp. 32-33; No. 282, p. 1116. Washington, Oct. 2 and Nov. 30, 1912.

The exhibition will include, among others, the sections: Alimentation, Agriculture and Horticulture. Applications for space should be addressed to "La Exposición Internacional de Productos de Importación y Exportación, Barcelona". Branch offices of the exhibition are also located at 148 Boulevard Voltaire, Paris, France, and 87, Rue des Foulons, Brussels, Belgium.

8 - International Colonial Exhibition at Samarang, Dutch East Indies, in 1914.

The Board of Trade Journal, Vol. LXXIX, No. 838, p. 605. London, December 19, 1912.

An International Colonial Exhibition will be held at Samarang in September, 1914. The exhibition will comprise sections for agriculture and horticulture (including machinery, etc., for cultivation and manufacture of sugar, coffee, etc.); the industries of the Dutch East Indies; foreign industries (including machinery and appliances for *a*) supplying motive power, *b*) agricultural and forestry purposes, *c*) industrial purposes, *d*) general purposes, and *e*) household purposes); commerce, etc. Applications for space must be sent, not later than March, 1914, to the Secretary of the Exhibition, Samarang, or to the Office of the N. V. Nederlandsch-Indisch Publiciteits Bureau, N. Z. Voorburgwal 254, Amsterdam.

9 - Bristol Show, from 1st to 5th July, 1913.

Royal Agricultural Society of England. Annual Show at Bristol. Tuesday, July 1st, to Saturday, July 5th, 1913.

10 - Agricultural Exhibition at the Hague in 1913.

The Board of Trade Journal, Vol. LXXIX, No. 836, p. 494. London, December 5, 1912.

A National and International Agricultural Exhibition is proposed to be held at the Hague from the 3rd to the 15th September 1913. Entry forms and full particulars may be obtained from the Secretary of the Royal Netherlands Agricultural Society, 42, Buitendorf, The Hague.

11 - The Great Agricultural Week in Belgium in 1913.

La Grande Semaine agricole belge de 1913. — *Laiterie et Elevage,* Year 7, No. 22, p. 180. Louvain, November 30, 1912.

The Society of Agricultural Mechanics and of Agricultural Industries has just fixed the date of the 5th exhibition of agricultural machines, which will be held at the Palais du Cinquantenaire in Brussels from March 8 to 17, 1913.

As was the case last year, this exhibition will coincide with the Great Agricultural Week in Belgium.

Persons desirous of obtaining either the programme of the Exhibition of Agricultural Machinery, or the programme of the Great Agricultural Week, should apply to the Société de mécanique et d'industries agricoles, 20 Rue Neuve, Bruxelles.

12 - International Forestry Congress, Paris, June 16-20. 1913.

From the programme of the Congress communicated by the "Touring-Club de France," which is organizing the Congress, the following chief points may be reported.

1st. Section. — Forestry technique, or sylviculture: *Lengthening the coppice rotation and coppice-with-standards. Forest fire insurance. Forest protection.*

2nd. Section. — Forest economics and legislation: *Rating of woodlands.*

3rd. Section. — Forestry technology.

4th. Section. — Forestry work on a large scale: *Improvements of pastures. Recovery of mountains. Trees and water.*

5th. Section. — The forest in the development of touring and the aesthetic education of the people: 1) *Beauty of the country due to forests.* 2) *National parks.* 3) *Management of forests from the tourist point of view.* 4) *Sylvo-pastoral instruction.*

Art. 3 of the Regulations of the Congress provides that:

The Congress is to consist of French members and of foreigners; the subscription is fixed at 20 fr. and requests for admission are to be addressed to the President of the Organisation Committee, Headquarters of the Touring Club de France, Paris (65, Av. de la Grande Armée), naming the section which the member wishes especially to attend.

13 - Fourteenth International Poultry Exhibition in Paris in February 1913.

14e Exposition internationale d'Aviculture. - *Revue d'Aviculture technique et commerciale,* No. 40, p. 339. Paris, October 1912.

The "Société des aviculteurs français" announces that its Fourteenth International Exhibition of Poultry will be held on the first Friday in February 1913. This exhibition will also include a "fur and feather" section. Detailed information can be obtained from the Secretary of the Federation of French purveyors of eggs, fowls and game: Paris, 136 Rue de Rivoli.

CROPS AND CULTIVATION

14 - Investigations on "Sickness" in Soil, Soil Sterilisation, and Some Practical Applications.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY.

1. RUSSELL, E. J. and GOLDING, J. Investigations on « Sickness » in Soil. I. Sewage Sickness. — *The Journal of Agricultural Science,* Vol. V, Part I, pp. 27-47. Cambridge, Oct., 1912.

2. RUSSELL, E. J. and PETHERBRIDGE, F. R. Id. II. « Sickness in Glasshouse Soils ». — *Ib*, pp. 86-111 + plates II-V.

3. STONE, G. G. The present status of soil sterilization. — *Twenty-fourth Annual Report of the Massachusetts Agricultural Experiment Station, Part I., Detailed Report of the Experiment Station*, pp. 121-125 + figs. 1-2. Boston, 1912.

4. LODGE, C. A. and SMITH, R. G. Influence of soil decoctions from sterilised and unsterilized soils upon bacterial growth. — *Ib.*, pp. 126-134.

5. See No. 45, *B.* Jan. 1912 and No. 485, *B.* March 1912.

6. Cf. *Lafar's Handbuch der Technischen Mykologie*, III. Band; V. BEHRENS, J., Mykologie des Dungers und des Bodens, § 116, pp. 447-450. Jena, 1904-1906.

7. Cf. LÖHNIS, F. *Handbuch der landwirtschaftlichen Bakteriologie*, V. C. Die Beeinflussung der Tätigkeit der Bodenorganismen, pp. 732-790. Berlin, 1910.

Russell, and Hutchinson have shown that micro-organisms of ordinary soils are not working at a maximum efficiency; that there exists a biological factor, provisionally identified with the soil protozoa, detrimental to bacteria and limiting their numbers and activities. It may therefore be found that causes not in themselves harmful to bacteria may bring about a reduction of bacteria through favouring the detrimental factor.

I. — Russell and Golding have studied the soil of a sewage farm, which about three years ago showed marked signs of « sewage sickness ». At this farm the sewage is simply screened and then applied to land that has been ploughed and is later to be cropped ; elsewhere it is applied direct to growing crops. So long as percolation is rapid the method works well, but « sewage sickness » sets in when percolation becomes too slow.

Examination of a sewage-sick field showed that the falling off in the rate of percolation was due to at least two causes. Wherever a pool of sewage had stood a green-black slime was found; the green material at and above the water-level was seen to contain living organisms. A second cause is the deflocculation of the clay by the free alkali of the sewage. Both these causes render the soil sticky and impermeable ; but they can be put out of action : the deflocculation by dressings of lime, and the accumulation of the slimy material by ploughing up the land into ridges and allowing it to dry.

There is however another factor. Analysis of the soil and laboratory partial sterilisation experiments have shown that a factor detrimental to bacteria can be traced in sewage-sick soils. This factor appears to be in every respect similar to that shown by Russell and Hutchinson in ordinary soils. It is put out of action by the same antiseptics (carbon disulphide and toluene) and by heat. It is not bacterial nor is it any bacterial product ; it is not carried by an aqueous extract of the soil. On the other hand it is transmitted to partially sterilised soils by inoculation with untreated soil ; it is not rendered inactive by aeration or by liming. Its effects are, however, much more pronounced in sewage-sick soil than in ordinary soil. While the bacteria in the untreated sick soil only rarely rise to 40 millions per gr., they may rise to 400 millions per gr. in the partially sterilised soils. The high amounts of moisture and organic matter in the sewage-sick soil appear to be especially favourable to the harmful factor.

Sewage sickness is thus regarded, in part, as an abnormal development of the harmful factor always present in ordinary soils. As in the case of ordinary soils, all the properties of the harmful factor indicate that it is biological and is due to in organisms larger than bacteria. Examination of the untreated soil showed the presence of amoebae and other protozoa, some of which could be separated in an active form by centrifuging; none were present in the partially sterilised soil. All the evidence available then points to these as constituting the harmful factor.

As to the economic problem of applying these results to the treatment of sewage-sick land, particularly with the view of ascertaining whether partial sterilisation of the soil causes increased purification of the effluent, or whether any modifying factors come into play when the experiment is conducted in the open field, besides an experiment with a number of small land filters filled with partially « rested soil », a series of small plots was laid out, the weights of turnips produced being, in thousands of pounds per acre:

Plot treatment —	Untreated —	Pared and burned	Treated with carbon disulphide	Treated with toluene
Total produce . . .	[illegible] 30.2	31.6	32.0	36.8

Larger plots of $^1/_{10}$ of an acre were set out on the Midland Agricultural College sewage farm at Kingston-on-Soar and drains were laid 18 in. deep, so that the effluents from each could be tapped. One of two pairs of comparable plots was treated with commercial « toluol » at the rate of 4 cwt. per acre, the injections being about 3 in. apart and 6 in. deep. General inspection showed that the effluent from the toluol treated plot was the better in each case both in colour and in smell, and the same fact is shown by the analyses of the effluents.

The present practical conclusion is that after the harmful factor is killed by partial sterilisation, the bacteria multiply rapidly and rise to high numbers, effecting more decomposition of the added sewage so that a purer effluent is obtained. No complicating factors appear to be introduced when the method is tried on a large scale, and it is little doubted that once the practical difficulties of partially sterilising large quantities of soil are overcome it will find useful application in sewage farm practice wherever the rate of decomposition is limited by the numbers of bacteria.

2. — Russell and Petherbridge had already shown that partial sterilisation affords a satisfactory method of treatment of « sickness » in glasshouse soils, and trials made in commercial glasshouses have shown that it is also practicable on a large scale, especially in tomato and cucumber houses. Further conclusions are:

I. Sickness in glasshouse soils is conditioned by at least two factors:

(*a*) an accumulation of insect and fungoid pests,

(*b*) a lowered bacterial efficiency.

II. The lowering of the bacterial efficiency is due to the accumulation of a factor detrimental to bacteria. This factor resembles in every way that present in arable soils; it is put out of action by heat or by antiseptics; in all respects its properties agree with those of protozoa.

III. There is no evidence that sickness is due to an accumulation of bacteria acting unfavourably on the production of plant food, *e. g.* denitrifying bacteria; or that the beneficial effect of partial sterilisation is due to the destruction of such bacteria; so far, it has been found that all bacterial actions are accelerated in partially sterilised soils.

As to the commercial treatment of sick soils, two general systems may be adopted: the soil may be heated to 90-100° C., or it may be treated with some antiseptics. These systems are fundamentally different. At 90-100° a certain amount of decomposition takes place, with formation of products having important secondary effects on the plant. Treatment of the soil with antiseptics causes much less decomposition, but certain secondary effects are seen in this case also. Thus, in discussing methods of treatment capable of application on a large scale, regard must be had not only to the cost and practicability, but also to

(*a*) the effect on the bacterial activity in the soil,
(*b*) the effect on disease and parasitic organisms,
(*c*) the secondary effects on the plant.

Exposure to a temperature of 96°-98° C. for two hours has proved the best method, because it not only kills destructive and parasitic organisms, including *Heterodera*, but also effects a certain amount of decomposition, thus lightening the subsequent work of the bacteria and bringing about certain secondary results, notably a great development of fibrous root. This treatment is practicable on a large scale, but the present cost of heating one ton of soil is about 1*s.* to 1*s.* 6*d.* A temperature of 55° C. maintained for 3 hours suffices to kill destructive and parasitic organisms and thus remedy sickness, but it does not effect the secondary changes.

An application of antiseptic may prove more convenient than heat if the purely mechanical difficulty of distribution is overcome. The antiseptic should be some cheap substance or mixture of substances that can:

(*a*) put out of action the factor injurious to bacteria;

(*b*) kill *Heterodera* and the spores of parasitic disease fungi in the soil;

(*c*) when its work is done disappear from the soil by volatilisation, oxidation or other decomposition, leaving no permanent bad effects behind;

(*d*) if possible lead to the same fine root development as a temperature of 98° C.

Russell and Petherbridge give a list of six classes of substances that more or less satisfy the first three conditions: formaldehyde; the lighter hydrocarbons of the tar oils — benzene, toluene, and the lighter homologues present in the so-called light solvent naphtha and heavy solvent naphtha —; the heavier hydrocarbons of the naphthalene fraction; the tar acids — phenol, cresylic acid, etc. —; the tar bases — pyridene and the homologues —; calcium sulphides. Of these the lighter hydrocarbons are not convenient for large scale work because of the cost of transport and the difficulty of application; the others are more suitable; they are carried at ordinary rates and are readily put on to the soil because they are or can be made miscible with water. Further investigation however is necessary to discriminate between the various substances; in the meantime it is insisted that no waste product should be recommended until it can be obtained to a definite specification, and the behaviour of its separate constituents is known.

3 and 4. — A somewhat different point of view is entertained by Stone and his pupils, of the Massachusetts Agricultural Experiment Station. They recognise the stimulant effects of soil sterilisation on plant growth, but they maintain that the benefits resulting from soil sterilisation depend upon the chemical and physical conditions rather than upon the number of protozoa.

Lodge and Smith have carried on three series of experiments with two types of soils, a loam rich in organic matter and a subsoil deficient in organic matter. 400 gr. of each soil were placed in a percolation tube and lukewarm distilled water was allowed to percolate several times through the soil; the percolated water was then placed in flasks, each flask containing 100 c. c. of percolate; then the decoction was subjected to steam pressure of 15 lb. for 45 minutes and at 121° C.

In series No. 1 a sterilised and unsterilised loam were used, and the sterilised decoctions inoculated with ordinary soil bacteria; the sterilised loam decoctions were found to contain a far greater number of bacteria than the unsterilised decoction. In series No. 2 a sterilised and unsterilised loam, and in addition a sterilised and unsterilised subsoil, were used, and the sterilised decoctions inoculated with ordinary soil bacteria; when a sterilized loam was used a greater number of bacteria were also found present than in the unsterilised loam decoction; but when a sterilised and unsterilised subsoil were used in the decoctions, a greater number of bacteria were found in the unsterilised decoction; this fact is assumed by the experimenters to prove that the sterilising of this particular soil resulted in adverse conditions for bacterial increase, and that decoctions made from different soils affect the growth of bacteria in a decidedly different manner. The remaining contents of the soil culture used in inoculating decoctions in the experiments of series Nos. 1 and 2 were subjected to a careful microscopic examination; no protozoa were found; neither were they observed to be abundant in a number of samples of the loam and subsoil. To avoid any possibility of introducing protozoa at the time of inoculating the decoctions, in the experiments of series No. 3 a sterilised and unsterilised loam and subsoil were used, as in series No. 2, but inoculations were made from a pure culture of *Bacillus subtilis*; the data given show that *Bacillus subtilis* multiplies in great numbers in all decoctions; a great number were found in the sterilised loam decoction as compared with the unsterilised and also a greater number were found in the unsterilised subsoil decoctions than in the sterilised decoctions.

The stimulating or retarding effects on the development of bacteria of the two types of sterilised soil used are similar to those produced in a previous experiment upon the growth of crops in these soils.

Growth of Soy Beans in Sterilised and Unsterilised Loam and Subsoil.

	Number of Pots	Average Length of Stems in unsterilised Soil	sterilised Soil	Gain or Loss in sterilised soil
	—	cm.	cm.	Per cent.
Loam	4	9.53	10.87	+ 14.05
Subsoil	4	9.79	4.14	— 17.70

These experiments, made with a different soil, would not confirm those of Russell and Hutchinson, who maintain that protozoa influence the number of bacteria in soils, since the development of bacteria differs in soil decoctions according to the composition of the soil used; that is, the number of bacteria which develop in a soil would depend upon the chemical and physical conditions rather than upon the biological conditions. These experiments, however, do not necessarily preclude the idea that protozoa might play a much more important rôle in soils other than those experimented at the Massachusetts Experiment Station, Amherst, Mass.

PROVISIONAL CONCLUSION.

I. It can be fairly stated, that partial sterilisation, especially of sick soils, may prove an efficient method of stimulating the development of bacteria and therefore of plant growth.

II. It is not equally sure if the limiting factor of bacterial growth be a biological, or a chemical and physical property of the soil; perhaps this factor may differ according to circumstances.

15 – Researches on Alkaline Meadows and Pastures.

FLODERER, A. (Chemist at the Agricultural Experiment Station of Magyaróvár, Hungary). A békésesabai szikes öntözött réten és legelön folytatott sziktanulmányokról. Országos m. kir növenytermelési *Kísérleti állomás*, Magyaróvárott. — *Kísérletügyi Közlemények*, Vol. XV, No. 3, pp. 390-418. Budapest, July-September, 1912.

The Agricultural Experiment Station of Magyaróvár has made at Békés-esaba during the last 10 years a series of experiments on irrigated alkaline meadows and pastures (« Szik ») to determine whether irrigation diminishes the amount of alkaline salts, or in other words, if the alkaline soils can be thus modified and improved. To obtain detailed data respecting the distribution of the salts in the soil, the writer made several borings on the same plot and studied, not only the superficial layer, but also the strata at depths of from 30-120 cm. (12 to 48 inches) and estimated the salinity of these. The summary of his results was as follows:

Irrigation produces a certain amount of lixiviation of the harmful salts; the diminution in soda, the alkali which is the most injurious to plants, being especially noticeable.

The removal of the salts, which is effected chiefly at the commencement of irrigation, together with the increased water supply, explains the maximum yields obtained during the first three years. The plants not only grew more vigorously, but the good species became predominant. The improvement takes place chiefly in the superficial soil. The richer the first stratum of 30 cm. (12 in.) is in salts, the greater is the improvement, for as the roots do not penetrate very far into stiff alkaline soils, the part played by the sub-soil is negligible.

In the case of a more intensive cultivation of the superficial layer, recourse must be had after some time to a systematic use of fertilizers. The manuring of alkaline soils only attains its ends if the former are improved to the point of growing the most useful plants in a satisfactory manner. Where the amount of alkali present is large in clay soils, only phosphatic and nitrogenous fertilizers are of advantage, potassic fertilizers are of no effect.

With regard to the powers of resistance possessed by various plants, sugar beets can grow in a soil containing from 0.15 to 0.2 per cent. of salts ; but mangolds are able to develop in the presence of even larger quantities. Lucerne, on account of its long roots, can only be cultivated where the salts content is from 0.1 to 0.15 per cent., or at most, from 0.15 to 0.2 per cent. The presence of soda, however, greatly hinders its development. *Lotus corniculatus*, on the other hand, still grows in soils containing 0.2 to 0.3 per cent. of salts and 0.14 per cent. of soda ; thus it resists alkalinity in the soil better than lucerne or red clover, the latter being a more delicate plant than lucerne.

16 - The Composition of Soil Suitable for Rubber Cultivation.

WOHLTMANN, F. : Südamerikanische und Ostafrikanische Kautschuk Böden. — *Der Tropenpflanzer*, Year 16, No. 11, pp. 571-581. Berlin, November, 1912.

The writer, Director of the Agricultural Institute of the University of Halle, has analysed samples of the soils which were most suitable for growing rubber and which had been sent from Brazil ("Seringal", Saõ Francisco, near Mt. Alegro), from Bolivia (" Seringal ", Philadelphia, near Cobijia), from the higher basin of the Amazon and from German East Africa.

The following table gives some of the detailed results obtained by the writer.

In comparing the fertility of the soils of South America with those of German East Africa, it is necessary not to lose sight of the fact, that in the former country the annual rainfall is 120 inches, while in the latter it only amounts to 80 in. near Tanga and in East Usambara, and 48 in. in Morogoro. Thus, in the soils of South America the nutritive substances are more transportable and more easily assimilated than in the soils of German East Africa, which would only be as fertile as the former if they contained about 33 per cent. more of nutritive substances. The species of rubber trees cultivated are different in the two cases : *Hevea brasiliensis*, which requires an abundant rainfall, is cultivated in South America, and *Manihot Glaziovii*, which fares best in a dry climate, is grown in German East Africa. But the products obtained are chemically the same, whence it is believed that both species require the same, or nearly the same, soil.

Composition of some of the best rubber soils.

Type of soil	Source	Nitrogen	Lime	Magnesia	Phosphoric acid	Total potash
		per cent.	per cent.	per cent.	per cent.	per cent.
Fine loam	Seringal, Saô Francesco, Brazil	0.085	0.050	0.116	0.076	0.233
»	Seringal, Philadelphia, Bolivia	0.124 – 0.147	traces	traces	0.026 – 0.038	0.272 – 0.442
Sandy clay	Tanga	0.077 – 0.225	0.180 – 0.360	0.023 – 0.042	0.039 – 0.052	0.027 – 0.033
»	East Usambara Longusa . .	0 – 0.058	traces – 0.026	traces – 0.009	0.012 – 0.055	0.134 – 0.325
Typical red soil	Ngambo II .	0.11 – 0.39	0.013 – 0.080	0.007 – 0.015	0.127 – 0.229	0.399 – 0.471
Red humic soil	Magunga . .	0.11 – 0.26	0.09 – 0.37	traces	0.28 – 0.35	0.32 – 0.46
Brown loam	Morogoro II.	0.09 – 0.16	0.18 – 0.253	0.29 – 0.43	0.111 – 0.174	0.616 – 0.871
Dark red soil	» IV.	0.12 – 0.15	0.073 – 0.127	0.051 – 0.081	0.055 – 0.149	0.34 – 0.48
Laterite	» V.	0.038 – 0.135	0.005 – 0.080	0.019 – 0.076	0.03 – 0.068	0.112 – 0.505
Medium red soil.	» VI.	0.105 – 0.165	0.033 – 0.09	traces	0.08 – 0.12	0.341 – 0.533

This idea seems to be confirmed by the analytic results of the writer. He considers himself justified in deducing the following conclusions regarding the selection of a good soil for rubber trees :

1. Such a soil should be fine, of medium coherence, rather loose than heavy, and deep. The combined fineness and depth of the soil bring about a dampness, which appears to be indispensable to the formation of latex. Loams or clay loams with from 95 to 100 % of fine particles are the soils to be preferred, those rich in laterite, or iron compounds, are apt to be deceptive, while compact clays, and especially soils with extreme characters, should be rejected.

2. With regard to the nutritive substances :

a) It is not necessary that the nitrogen content should be high; a large percentage of humus is perhaps downright injurious ; 0.1 per cent. of nitrogen is sufficient, especially in districts with a large rainfall.

b) As for lime and magnesia, rubber trees only need very limited amounts of these substances. It is not yet known whether a high percentage of lime and magnesia hinders latex formation, or if the trees suffer in calcareous soils.

c) The rubber tree appears to have no special requirements as regards content in phosphoric acid.

d) It seems, on the other hand, that a large amount of potash in the soil promotes growth and the formation of latex ; it is therefore advisable to use fertilizers containing potassic salts.

17 – Soils from the East Africa Protectorate.

Bulletin of the Imperial Institute, Vol. X, No. 3, pp. 405-422. London, Oct. 1912.

Analyses of a certain number of soils from the East Africa Protectorate have already been published in the above Bulletin (1907, Vol. 5, p. 243), and a further series are now given

The results are tabulated in the accompanying table. The lime is deficient in almost all cases, except in the Jubaland soils. Phosphoric acid is also most consistently deficient whilst the nitrogen content varies considerably. The potash is abundant everywhere and an analysis of rock struck while sinking a well indicates that the source of these large supplies is andesite. In the Jubaland soils the soluble alkali salts are very high and would have to be taken into consideration in subsequent treatment. Applications of ground rock phosphate, ground limestone, and green manure are recommended to supply deficiencies of phosphates, lime and nitrogen respectively.

Analyses of Soils from the East Africa Protectorate.

Soil	Texture	Lime	Phosphoric acid		Potash		Nitrogen
		Sol. in HCl.	Sol. in HCl.	available	Sol. in HCl.	available	
Soysambu (1st series)	sandy loam	1.25	0.223	0.126	1.18	0.195	0.151
Njoro 1	sandy loam	0.34	0.023	0.003	0.245	0.015	0.202
» 2	sandy loam	0.36	0.24	0.003	0.259	0.033	0.181
Surface of well	clay loam	0.587	0.013	0.0007	1.239	0.068	0.009
Soysambu 1 (2nd series).	loam	1.900	0.054	0.005	1.665	0.113	0.164
» 2	sand	0.325	0.037	0.0018	0.995	0.059	0.009
» 3	sand	0.362	0.007	0.003	2.630	0.046	0.120
» 4	sandy loam	0.237	0.031	0.012	3.660	0.051	trace
» 5	sandy loam	0.435	0.041	0.009	2.804	0.092	0.140
Tana 1	fine loam	4.22	0.21	0.001	4.25	0.028	0.054
» 2	clay loam	2.47	0.20	0.0007	1.71	0.025	0.055
Jubaland 1	clay	3.89	0.18	0.022	1.35	0.030	0.080
» 2	sandy	2.04	0.04	0.016	0.85	0.031	0.05
» 3	loam	4.35	0.17	0.045	0.97	0.012	0.04
» 4	sandy	5.13	0.17	0.014	0.59	0.014	0.11
» 5	loam	7.50	0.19	0.002	0.61	0.007	0.09

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

18 - Irrigation in the United States.

1. STABLER, HARRY SNOWDEN: The Safe Side of Irrigation Investments.

2. The Future of Irrigation. — *The Country Gentleman* Vol. LXXVII, No. 38, pp 3. and 18, No. 40, pp 4, 5 and 20, No. 47, p. 1. Philadelphia; September 21, October 26, November 23, 1912.

Seventy millions of dollars (about £14 400 000) have been invested by the United States Government in irrigation. Thirty-two reclamation projects, located in eighteen States, have been completed or are in process of development. At the end of the last fiscal year the operations completed included Government reservoirs with a capacity sufficient to irrigate 5 000 000 acres to a depth of one foot, 300 miles of canals, 1000 miles of ditches, 5 000 miles of watercourses, 20 miles of tunnels, etc. Further, the Reclamation Service will expend twenty million dollars (about £4 100 000) on irrigation works before the end of 1914. Water is now being served to 14 000 farm families. For 1911 the crop production on the irrigated territory was estimated at $12 000 000 (about £2 460 000). The Government still possesses about a quarter of a million acres of land for which water is available under completed or partly completed works.

Extent of Irrigation in the United States.

	Acreage irrigated in 1909	Percentage of total	Acreage that could be irrigated in 1910	Percentage of total	Acreage included in projects	Percentage of total
Arid region	13 739 499	100.0	19 335 711	100.0	31 112 110	100.0
United States Reclamation Service	395 646	2.9	786 190	4.1	1 973 016	6.3
United States Indian Service	172 912	1.2	376 576	1.9	879 068	2.8
Carey Act enterprises . .	288 553	2.1	1 080 677	5.7	1 573 874	8.3
Irrigation districts . . .	533 142	3.9	804 951	4.2	1 580 865	5.1
Cooperative enterprises .	4 646 039	33.8	6 101 677	32.0	8 845 437	28.4
Commercial enterprises. .	1 444 806	10.6	2 416 516	12.5	5 096 337	16.3
Individual and partnership enterprises	6 258 401	45.5	7 667 124	39.6	10 154 573	32.6

The valuation of the returns of the capital invested in irrigation schemes seems to Mr. Stabler to have been often exaggerated or referred only to the most favourable conditions possible: consequently it is not generally applicable, nor suitable to average conditions and to farmers of medium capacity. Further, in all districts in which irrigation is begun the prices of produce are much higher during the first years, and an investment of capital based on the yield and profits of such a period would stand much probability of being a mistake.

Whilst a Government report states that well conducted farms under the rotation: lucerne, cereals, sugarbeets and potatoes, yield per acre 40 to 60 bushels of wheat; 75 to 110 of oats, 50 to 90 of barley, 300 to 500 of potatoes, 15 to 20 tons of sugar-beets and 4 to 6 tons of lucerne, the average yields of the above crops in 9 States of the arid region for which data are available, namely Colorado, Arizona, New Mexico, Wyoming, Utah, Montana, Washington, Oregon and Idaho, according to the last census were only: wheat 24.5 bushels; oats 37.1; barley 24.5; potatoes 144.6; sugarbeets 11.36 tons; lucerne 2.97 tons per acre; and in nine States in the humid region (Indiana, Illinois, Iowa, Wisconsin, Michigan, Minnesota, New York, Maryland, Mississippi) they were: wheat 16 bushels; oats 28; barley 21.6; potatoes 101.2. The figures for sugarbeets are lacking in the statistics. The author sets them down at over 9 tons per acre.

The development of an irrigated farm is always a slower and more costly undertaking than that of one which avails itself only of rainfall, as the former requires perfect levelling of the surface and the erection and upkeep of the irrigation works in addition to the strict farm operations.

The crops obtained by means of irrigation are burthened with the cost of the irrigation works and of the water rights, from which non-irrigated crops are free. This extra cost is partly offset by larger returns per acre, but the profits in turn are often reduced by the distance from market. Therefore this factor in relation to the kind of crops grown must be carefully considered.

The writer estimates as follows some items of the cost of production:

			per acre
Clearing of sage brush or other plants by drawing a heavy split log or steel rail with a team hitched to each end, across the land . . .	$	2 to 5	(8s. 3*d.* to £1 0s. 7*d.*)
Levelling the soil	„	3 to 30	(12s. 4*d.* to £6 3s. 4*d.*)
Excavating the supply and distribution ditches and building the accompanying structures	„	2 to 5	(8s. 3*d.* to £1 0s. 7*d.*)
Cost of applying water to the land	„	1.50 to 3.50	(6s. 2*d* to 14s. 5*d.*)
Average cost of maintenance and supply . . .	„	1.07 to . .	(4s. 5*d.* to . . . .
Drainage: the cost differs very much. An average may be taken at	„	15.	(£3 1s. 8*d.*)

The cost of drainage varies so much that it is difficult to estimate an average. It may be said, however, that from experiments made by the Government in reclaiming lands that had been alkalied or waterlogged and bringing them back to their former productiveness the average cost was close to $15 (£3 1s. 8*d.*) per acre.

In another Government publication is an estimate of expenses for the first two years' operations on a small irrigated farm in Arizona:

	$	£	s	d
Land 7.2 acres at $100 per acre	720.00	147	19	0
Survey and papers	20.00	4	2	2
Levelling by contract	124.00	25	9	7
Fencing, head gate, pumps, small two-room cottage and shelter for horses	271.00	55	13	9
Team, wagon, plough, harrow, garden tools, mowing machine	615.00	126	7	6
Total preliminary outlay	$1750.00	£359	12	0

	$	£	s	d		
First year — Cash for seed, water, crates etc.	127.92	26	5	9		
Second year — Cash for seed, water, crates, etc.	226.19	46	9	8		
Improvements	59.28	12	3	6		
Hired labour	72.00	14	15	11		
Total expenses for two years	———	———			485 39	99 - 14 - 10
Total cost					$ 2235.39	£459 - 6 - 10

The following data refer to another farm in a State farther north and are also taken from a Government bulletin: "The average cost of the first house built on a new farm does not exceed $450 (£92 9*s.* 4*d.*). The barn will cost $200 (£41 2*s.*) and a shed for tools $100 (£20 11*s.*). The necessary tools, such as ploughs, harrows, drills, mowers and binders, together with wagons, horses, harness, one cow, shovels, forks, and so on, will cost from $800 to $1500 (£164 8*s.* to £308 4*s.*), the average being probably $1100 (£226). To fence 160 acres of land with a four-wire barbed-wire fence, posts of cedar 40 feet apart, and brackets each 10 ft. apart, will cost $400 (about £82). A capital of $2500 (about £513) would be sufficient for a settler, provided he had enough money in addition to pay the first and second instalments on his land and water right. On 160 acres this payment would average $550 (£113) per annum." This is at $30 (£6 3*s.* 3*d.*) an acre for land and water.

There is no mention above of costs incidental to irrigation, so they are given here on an acreage of 80 acres.

	$	£	
First two payments on land and water right	480.00	(98	13*s.*)
House	450.00	(92	9*s.*)
Barn	200.00	(41	2*s.*)
Tool-shed	100.00	(20	11*s.*)
Implements and stock	1100.00	(226	0*s.*)
Fencing	200.00	(41	2*s.*)
Clearing land	240.00	(49	6*s.*)
Levelling	400.00	(82	4*s.*)
Ditches and structures	240.00	(49	6*s.*)
Maintenance and supply — water rental — for 2 years	160.00	(32	17*s.*)
Cost of applying water for 2 years	240.00	(49	6*s.*)
	$ 3810.00	(£782	15*s.*)

This estimate holds good for Wyoming, Montana, Idaho, or the Dakotas. For a smaller acreage in Colorado, Washington or Oregon the outlay would be the same on account of the higher price of land and water rentals, both of which would be at least double; and in California they would be greater still.

In the Western States the fifty-five thousand different irrigation enterprises are capable of supplying water to nineteen million acres; of these about six million have not yet been sold.

19 - Availability of Nitrogen in Organic Ammoniates.

(1) COULSON, T. H. Availability of nitrogen in organic ammoniates. — *The American Fertilizer*, No. 10, Vol. XXXVIII, pp. 44-45. Philadelphia, Nov. 16, 1912.

(2) STREET, J. P. Note on the neutral permanganate method for the availability of organic nitrogen. — *The Journal of Industrial and Engineering Chemistry*, Vol. 4, No. 6, pp. 437-438. Easton, Pa., June 1912.

(3) JONES, C. H. Activity of organic nitrogen as measured by the alkaline permanganate method. — *Ib.*, pp. 438-441.

(4) HARTWELL, B. L. & PEMBER, F. R. The effect of the « wet process » on the availability of low grade nitrogenous materials. — *Ib.*, pp. 441-443.

The addition of phosphatic manures to organic materials is shown to interfere with the neutral permanganate method for estimating the availability of organic nitrogen; the use of small quantities of sodium carbonate in the process gave very satisfactory results, which agree well with those obtained by the alkaline permanganate method. The latter method gives useful information as to the quality of insoluble organic nitrogen in manures, this information being confirmed by vegetative trials.

The following analytical results are given:

1. Nitrogen as nitrates.
2. Nitrogen as ammonium salts.
3. Water-soluble organic nitrogen.
4. « Active » insoluble organic nitrogen (liberated by the alkaline permanganate process).
5. « Inactive » insoluble organic nitrogen.
6. Total nitrogen.

It was found that when the manure is derived from materials of high nitrogen content the figures given under the 4th heading are high in comparison with those given under the 5th, whereas when low grade materials have been used in the manufacture, the proportions are reversed. « Active » nitrogen is usually about 70 % of the total insoluble organic nitrogen, while with low grade materials it is 40% or lower.

The nitrogen in certain low grade materials, such as peat, garbage, tankage, roasted leather, is of a very low availability, but manufacturers claim that treatment by the so-called « wet process » completely changes its chemical and physical nature and materially increases its availability. Samples of such materials were taken before and after the process and yielded on analysis:

	Percentage of total nitrogen	
	Before treatment	After treatment
As ammonium salts.	6.5	14.3
As water-soluble org. matter	7.8	57.7
As water-insoluble org. matter . . .	85.7	28.0

From this the conclusion was drawn that when low grade ammoniates are used for making base goods by the « wet process », a large percentage of the nitrogen is rendered highly available for plant use.

All the above results were the work of a committee appointed by the directors of the Agricultural Experiment Stations of the New England States, New York, and New Jersey to investigate by laboratory methods the availability of organic nitrogen.

20 - **The Fertilizer Trade in the Netherlands.**

Communication from the Netherlands General Direction of Agriculture.

The General Direction of Agriculture, Division VI (Publications and Statistics), has compiled expressly the following table concerning the present condition of the production, importation, exportation and consumption of fertilizers in the Netherlands.

Production, importation, exportation, and consumption of fertilizers in the Netherlands in 1910.

Description	Production metric tons	Imports m. t.	Exports m. t.	Total consumption m. t.	Consumption by Co-operative Societies m. t.
Nitrate of soda	—	164 826	107 218	57 608	34 783
Sulphate of ammonia	10 000	31 031	23 473	17 558	3 658
Potash salts.	—	175 212	9 597	166 615	94 783
Basic slag	—	195 719	101 578	94 141	76 366
Superphosphates	150 000	—	—	90 000	62 865

To this table, which gives a good idea of the fertilizer trade in the Netherlands, the following information may be added as to the method used in obtaining the above data.

The total consumption of nitrate of soda was calculated by subtracting the amount exported from the quantity imported.

The production of sulphate of ammonia was estimated in 1907 at 10 000 metric tons. In comparing the amount purchased by the co-operative societies with the total consumption, the latter seems too high, perhaps on account of an error in the estimate of the production. In fact, according to a communication made to the International Institute of Agriculture by the

"Gemeente Gasfabrieken Hoofdkantoor," the production of the gas factories alone does not exceed 5 293.39 m. t. (1910).

The total consumption of potash salts and of basic slag has been estimated in the same manner as that of nitrate of soda. According to the data of the German "Kalisyndicat," the consumption of potash salts in 1910 was 178 000 m. t.

Some years ago, the annual production of superphosphate was estimated at 120 000 m. t., but a new factory having since been started, the present output may be reckoned at 150 000 m. t. There is a discrepancy in the importation and exportation figures, but this arises from the fact that they include much raw phosphate. Nevertheless, as the total consumption of superphosphate was estimated some years ago at 60 000 m. t., if these figures were correct, 90 000 m. t. is not too high an estimate for the present consumption.

21 - Phosphates and Nitrates in Egypt. Their Importance to European Agriculture.

1. Polier. La richesse agricole et minérale de l'Egypte. § 3 Les richesses minerales de l'Egypte. 8. Phosphates et Nitrates. — *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Vol. 118, No. 2, pp. 232-272 (268-270). Paris, August, September, October 1912.

2. Stutzer, O. Phosphate, Sonstige Phosphatlagerstätten Afrikas. — *Die Wichtigsten Lagerstätten der "Nicht-Erze"*, First Part, pp. 363-364. Berlin, 1911.

The discovery of large deposits of phosphate and nitrate in Egypt would be a very important matter, not only for Egyptian agriculture, since constantly increasing quantities of fertilizers are imported into the country, but also for the European agriculturist, who makes use of enormous amounts of these substances.

Nitrates. These have to be left out of consideration, for though large deposits of nitrate have been discovered in the Nile valley, the high proportion of sodium chloride they contain renders them useless. Further, they do not form crystalline masses, but are simply saliferous clays. The result of prospecting seems so far to be negative.

Phosphates. The phosphate deposits, on the other hand, appear likely to be a source of wealth to the country. Their presence has been observed at a large number of places all situated in a zone which, on the west of the Nile, includes the oases of Dakha and Kharga, while on the east it leaves the Nile between Keneh and a point south of Esneh, and stretches to the north-east up to the Red Sea, at Safadja and the west coast of Sinai. Outside this broad band, phosphate deposits have been found in the oasis of Baharia and quite to the south-east of the frontier of Egypt in the valley of Wady Hodein, on the shores of the Red Sea.

The principal known deposits are the following:

1. The first was discovered in the Nile valley 11 miles south of Esneh. A second was found on the plateau called Djebel el Qurm; this is 0.6 to 1.2 miles wide by 5 ½ long. The nearest station is 6 miles

distant, but connection with the railway could easily be effected. A third deposit is at Sebahia. The samples taken have yielded 70 % of tribasic phosphate.

2. An English Company has obtained concessions at Safadja on the shores of the Red Sea, but as no details of results have been divulged, the probabilities are that they have not been of a satisfactory nature.

3. The richest deposits are without doubt those of Rachid, in the Daklah Oasis. They extend throughout the whole length of the latter for a distance of at least 31 miles. The average thickness of the workable stratum varies from 6 to 10 ft. The bulk of the deposits occurs always on the edge of the desert on the borders of the cultivated land, and their exploitation would be a very easy task. Unfortunately, the Oasis of Daklah is in the open Libyan desert 370 miles from the Nile Valley. But lately the railway has been carried as far as the Oasis of Karghah, which is only 93 miles from that of Daklah.

Thus it is at Daklah that the prospects of Egyptian phosphates appear most brilliant. They have not escaped the notice of the Gafsa Phosphate Company, who are known to possess a quasi monopoly of the trade.

22 - New Methods for determining the Comparative Value of Selected Plants.

SELECTION.

1. HUMMEL, A. Massenanbauversuche. — *Illustrierte Landwirtschaftliche Zeitung*, Year 31, Nos. 88 and 89, pp. 821-824 and 829 + figs. 922-924. Berlin, Nov. 4 and 8, 1911.

2. BILGER, O. Zur Methodik der Sortenprufung. — *Ib.*, YEAR 32, No. 91, pp. 827-829 + figs. 898-900. Berlin, Nov. 13, 1912

Formerly, selected seeds were tested in the laboratory; now on the contrary, experiments made in the field are considered the most satisfactory. This has given rise to the development of comparative cultivation experiments of the new selected varieties, *e. g.* those carried out by the German Agricultural Society (Deutsche Landwirtschafts Gesellschaft), which have risen in number from 562 in 1905, to 726 in 1911. Of these 164 in the former year and 250 in the latter were devoted to oats.

The principal difficulty in such experiments is the avoidance of experimental errors, which prevent an exact estimation of the productivity of the new varieties. In Denmark and in Sweden, where such experiments are much practised, they are repeated on the same soil for from 3 to 8 years in succession. The new method proposed by Hummel and named by him the " compensation method " has the advantage of giving more immediate results, and consists essentially in the two following calculations:

1) Take the arithmetical mean of the results in absolute figures for every variety; to this, taken as 100, the results obtained from every plot of the same variety are referred, and thus all the results are given in percentages of the arithmetical mean for every variety submitted to experiment.

2) Take successive groups of 9 contiguous plots forming a large square, find for each group the arithmetical mean of the results referred to 100 as above; the difference between this figure and 100 represents the mean deviation of the square from the average of the whole experiment field. Then add this amount to the figure of the central plot, or subtract it, according as to whether it is negative or positive, and repeat the operation for all the plots.

The percentages thus corrected are recalculated in absolute figures, and to these the calculation of the probable errors is applied by means of the formula:

$$\frac{\Sigma \pm d \, . \, 0.845}{\sqrt{n \, . \, (n - 1)} \, . \, \sqrt{n}}$$

— where Σ is the sum of the separate results, d the difference between the separate results and the average, and n the number of the plots for every variety, 0.845 being a constant.

Now, calculating the probable error (by means of such a formula) in the direct experimental data and that in the data obtained by the proposed method, it will be found that this last is less.

In fact, in the practical case of the two comparative experiments made with 30 varieties of beans in a series of 6 lots and with 20 varieties of rape in a series of 5 lots, the probable average error for the whole experiment was reduced respectively from ± 9.19 to ± 6.90 and from ± 4.48 to ± 3.54 in percentage of the average.

In conclusion, the advantages of the new method proposed would be:

I. By means of the "compensation" calculation, part of the experimental errors which are inherent in comparative cultivation experiments are eliminated, and the sources of error are thus limited to those dependent on the separate lots.

II. Such errors as cannot thus be eliminated, are expressed in figures; thus the results can be subjected to mathematical criticism.

III. Selection having for its object the increase in the yield of cultivated plants, is thus placed upon a surer and more fitting basis.

23 - Cultural Bud Mutations of *Solanum immite* Dunal.

HECKEL, ED. Mutation gemmaire culturale du *Solanum immite*, Dunal. — *Comptes Rendus de l'Académie des Sciences*, Vol. 155, No. 18, pp. 804-806. Paris, Oct. 28, 1912.

After referring to his previous researches on the mutations of *Solanum tuberosum* L., a species growing wild in Bolivia and Peru, the writer gives the results he obtained with *Solanum immite* Dunal, which was brought by M. Verne from Chancay (north of Lima, Peru), that is the classic habitat of this species. In Chancay a complete mutation in the tubers and all the subterranean portions of the plants was obtained, although the tubers had only attained a slight degree of development (10 to 12 gr. maximum); further, the productivity of the plant appeared previously to be very small, for two specimens only bore 3 tubers; the latter however showed mutations. The writer did not consider the arguments for making *Solanum immite* a separate species sufficiently conclusive, and after having cultivated it a long time, he believes it should be regarded as identical with *S. tuberosum* L.

Its behaviour under cultivation (intensive fertilizing) as regards the mutation of its tubers, shows other points of similarity with *S. tuberosum*.

The mutation found in the latter occurred in one year, and this is the first time that M. Heckel has observed such a rapid change, which was at the same time far-reaching, affecting the various parts of the tubers and the stolons, which are very plentiful in the wild plant. In other cases, the mutation was slower, and attended by greater difficulties; sometimes in fact it did not occur (*Solanum Comersoni* and *S. Maglia*). The fact of the rapidity of mutation in the tubers in the type *S. tuberosum* and in *S. immite* Dunal perhaps explains the classic attribution of all cultural varieties to the wild *S. tuberosum* L. of Peru. This variety has no doubt accommodated itself to cultivation and to the production of edible tubers more readily than other wild species, and so quickly that it has been given the preference in cultivation over other kinds.

Once it has given rise to a mutation, it appears to produce varieties, which have tubers of different colours and shapes. This will be seen next season, in which all the tubers, both mutated and non-mutated, from the crop of 1912 will be used.

The writer obtained mutation in *S. Maglia* and *S. Commersoni* under conditions which show the slowness and the difficulty of this change.

No mutations have so far occurred in the tubers of *S. Jamesii* Torray, which has been cultivated for three years.

24 – *Solanum immite*, a New Species of Potato from Peru.

DENEUMOSTIER, CHARLES. Le *Solanum immite*, nouvelle espèce de Pomme de terre alimentaire du Pérou. — *Annales de Gembloux*, Year 22, Part 11, pp. 621-624, 6 plates. Bruxelles, Nov. 1, 1912.

Sr. N. Esporto, Botanical Assistant at the National Agricultural and Veterinary School at Lima, found in the lomas (1) of Pasamayo, prov. of Chancay, from 1906-1907, the species of *Solanum* which has a tuberous rhizome and which had been found for the first time about 1790 by Pavon, and been preserved in de Boissier's herbarium. It was determined by Dunal, who gave it the name of *S. immite* and considered it to be a distinct species. This *Solanum* was much sought after by the North Americans especially and it was regarded with interest as the possible origin of a new edible potato.

Selection and improvement experiments were carried out on this species at the Lima School and the results obtained showed that the yield and the tubers (weight and size) were capable of improvement.

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(1) Lomas = winter pastures on the high parts of the spurs of the Andes.

Its nutritive proprieties (at any rate as a feed for animals) are undoubted, judging by the eagerness of the pigs which are turned out in the "loma" during the winter season.

The tubers were placed in pots in April 1910; their weight varied from 0.5 to 5 grams. In September, about 300 tubers were harvested; their weight was from 0.5 gr. to 30 gr.

These were carefully preserved and planted in 1911, after having been classified according to size. They were planted in soil which had not been fertilized for a long time and where mulberry trees had grown for the last 5 years.

It was desired to obtain for 1911, a series of complete plants from which a first supply of tubers to be intensively cultivated with suitable manure could be picked out. Forty-five plants were separated out, of which the yield and vegetative characters were well known and which will form the point of departure of new selection experiments. The following figures give an idea of the first crops obtained.

The field was divided into six lots, of which three of 6 ft. 6 in. × 13 ft. were planted with the larger tubers. The crops were respectively 4.73 lbs., 5.03 lbs. and 9.41 lbs., with an average weight per plant of 113.376, 127.161, and 129.670 grams, while the average yield of the wild *S. immite* was only from 21 to 25 grams.

Plot IV (6 ft. 6 in.×13 ft) yielded 5.47 lbs.; plot V (6 ft. 6 in.×13 ft.) yielded 6.79 lbs.; the number of plants was not accurately known. Plot VI (13 ft.×13 ft.) produced 23.52 lbs. The following are some yields of separate plants; the weight is given in grammes:

173.10; 171.10; 180.60; 186.90; 192.50; 197.50; 206.20; 218.20; 232,20; 240.50; 280.40; 283.25; 311.75; 429.35; 460.80; 548.31; 667.45.

The writer calls special attention to the plant which had a tuber yield of 548.31 gr.; the rhizomes were superficially arranged, several of the neighbouring tubers were disposed in a parallel manner and belonged to different chains, of which four could be distinguished. It was observed that this plant possessed two well-developed stems above ground.

CEREAL AND PULSE CROPS.

25 - Recent Scientific Investigations Described in the First Collective Report of the Experiment Station for Cereal-Testing.

Wissenschaftliche Neuforschungen aus dem Ersten Sammelbericht der Versuchsanstalt für Getreideverarbeitung. pp. 206-210. Berlin, 1911.

A. *Characteristics of German Cereals. Bread-making properties of rye and wheat meal.*

I. Rye. The dough and bread-making properties of the 13 samples of rye examined (12 Petkuser and 1 Probsteier) were found to be excellent and to fulfil adequately all the technical requirements. Average dough yield was ascertained to be 155-158 grams, and bread-yield 138-149 grs. per 100 grs. of flour. The volume of the bread should be 300 cc. per 100 grs. air-dry flour, or at least, not fall far below this figure.

II. Wheat. The extensive data resulting from the examination of 26 varieties of wheat showed that local varieties were much superior to intensively selected ones in bread-making properties, while very inferior in yield. Usually, good baking local wheats have the higher gluten content . When mixed with other wheats, the selected highly productive varieties lose their defective properties and generally produce flour and bread of good colour.

Statistical estimate :

	Gluten		Dough yield	Volume
	damp	dry		
First grinding	32.0	10.1	162-163	376
Second grinding	33.7	11.1		420

The gluten content of the first grinding is usually 1 % lower than that of the second grinding, but the gluten of the first is softer, less firm, and has a greater power of taking up water.

Further, flour of 21 varieties of winter and 12 of spring wheat were examined.

Average of factors determined :

	Gluten		Dough yield	Volume	
	damp	dry		Household bread	Fancy bread
Winter wheat	30.0	10.0	170	415	390
Spring wheat	36.0	11.9	172	437	407

There is without doubt a certain relation between the amount of gluten present and the volume of the bread: a very low gluten content produces loaves of small volume, while the largest loaves are usually the result of using a flour which is rich in gluten.

The gluten content appears to show no parallelism with the quality of the bread.

B. *Characteristics of some foreign wheats.*

The North American wheats are distinguished by short firm gluten, and the bread made from them alone is inferior in quality; they are, however, very suitable for mixing with tenacious and soft wheats. The South American wheats have usually very extensible, soft gluten and the flour and bread made from them are soft and have a large volume, but the dough tends to be deficient in elasticity.

	Gluten		Amount	Volume	
	damp	dry	of dough	Household bread	Fancy bread
Average	40.4	12.9	171	427	408

C. *Nitrogen content and distribution in native wheats.*

Experiment showed that there was no close connection between the nitrogenous substances of different degrees of solubility and the quality of the flour. There seems, however, to be a connection between the constitution of the gluten and the amount of alcohol-soluble portion of protein, for firm short gluten contains less of the soluble part than does soft extensive gluten, but the behaviour of the flour, as a whole, does not depend upon the alcohol-soluble protein.

Protein which is soluble in water is also of no importance in estimating the quality of wheat flour.

D. *The Effect of manure on the composition and kneading properties of rye and of wheat.*

1. The use of chemical fertilizers as a rule slightly increases the weight per bushel; and potash fertilizers in no way injure this quality of the wheat.
2. There appears to be no clear relation between the weight per 1000 grains and the use of a fertilizer.
3. Complete manuring generally produces an increase in protein.
4. The ash content is not made higher.
5. The fat content remains the same.
6. The hydrocarbons, which behave in an almost opposite manner to protein, decrease slightly.

There is no regular connection between the amount of flour and the use of fertilizers.

Baking experiments showed, that the qualities distinguishing good flour: amount of dough, and the weight and volume of the loaves, are not affected by a complete fertilizer, at least in the case of rye. No satisfactory decision has been arrived at with regard to wheat, as the experiments made have been few and not extensive.

26 - Comparative Experiments in Barley Cultivation.

VARGA KALMAN. Összehasonlító árpatermesztésikisérletek. *Köztelek*, Year 22, No. 89, pp. 3051-3052. Budapest, November 16, 1912.

In Hungary, the value of brewing barley depends much on the date of its ripening, and therefore it is a mistake to introduce barleys from northern countries, which are late and usually shrivel during the great heat in July and become useless in the manufacture of beer.

Three years ago, the idea spread that "Hofbräu", "Golden melon", and "Probstei" varieties could be compared to "Hanna", which is especially suitable to Hungary.

From 1909 to 1911, the writer made a series of comparative experiments with the above-named varieties in order to ascertain: 1) the precise date of their ripening, 2) the influence exercised upon their quality by the application of nitrate, used with or without superphosphate. The experiments were carried out on plots belonging to the Agricultural Academy of Kassa in North Hungary, on deep and fairly heavy soil.

The barley always followed potatoes and the treatment of the soil was identical in both cases.

The data obtained respecting the average date of ripening are given in Table I.

TABLE I.

Varieties	Date of sowing			Date of germination			Date of tillering			Date of earing			Date of ripening		
	1909	1910	1911	1909	1910	1911	1909	1910	1911	1909	1910	1911	1909	1910	1911
Probstei	IV/4.	III/25	IV/7.	IV/18.	IV/3.	IV/21.	V/8.	V/12.	V/4.	VI/11.	VI/12.	VI/15	VII/19	VII/20	VII/16.
Golden-Melon	IV/4.	III/25.	IV/7	IV/20	IV/12.	IV/23.	V/10	V/12.	V/16	VI/10.	VI/14.	VI/16	VII/19	VII/22	VII/18.
Hofbrau	IV/4	III/25	IV/7.	IV/22	IV/11.	IV/24.	V/8.	V/16.	V/18	VI/13.	VI/16.	VI/12.	VII/25.	VII/26.	VII/23
Hanna	IV/4.	III/25.	IV/7.	IV/18.	IV/3.	IV/21	V/5.	V/4.	V/10	VI/5	VI/1	VI/7.	VII/3	VII/18	VII/12

TABLE II.

Varieties	Fertilizer used per acre	Average yields in 1909, 1910, 1911				Average percentage of protein	Average weight lb. per bushel
		Average weight per 10 shocks		lbs. per acre			
		Grain	Straw	Grain	Straw		
		lbs	lbs				
Hofbräu .	No fertilizer .	5 291.09	8 157.09	1 332.80	1 551.36	10.66	51.60
	93 lbs nitrate . .	5 621.78	8 598.02	1 271 24	2 718.48	12.85	51.60
	232 lbs superphosphate	5 401.32	8 377.56	1 488.02	2 856.04	10.70	52.00
	232 lbs superphosphate . . . . 93 lbs nitrate . .	6 062.71	8 598.02	1 643.25	2 418.48	10.80	52.00
Probstei . .	No fertilirer . . .	6 613.86	11 243.56	1 550.47	2 852.04	11.20	50.40
	93 lbs nitrate . .	7 054.78	12 125.41	1 828.81	2 868.10	12.80	50.40
	232 lbs superphosphate	7 165.02	11 904.95	1 844.86	2 914.49	11.00	52.80
	232 lbs superphosphate . . . . 93 lbs nitiate . .	7 275.25	11 904.95	1 736.03	2 944.82	11.30	52.80
Golden-Melon	No fertilizer . .	5 291.09	7 275.25	1 488.02	1 519.25	10.50	54.00
	93 lbs nitrate . .	6 172.94	8 377.56	1 736.03	1 565.64	13.10	54.40
	232 lbs superphosphate	6 062.71	7 716.17	1 704.80	1 550.47	11.80	54.40
	232 lbs superphospate . . . . . 93 lbs nitrate . .	6 613.86	7 826.40	1 860.03	1 828.81	11.80	54.80
Hanna . . .	No fertilizer . .	5 952.47	7 716.17	1 674.47	2 015.25	9.80	54.80
	93 lbs nitrate . .	6 062.71	8 598.02	1 704.80	2 015.25	10.20	54.96
	232 lbs superphosphate	6 724.09	7 936.63	1 844.86	2 480.04	9.90	52.64
	232 lbs superphosphate . . . . 93 lbs nitrate . .	7 826.40	9 038.94	1 891.25	2 464.87	9.85	54.40

It will be seen by this table that the "Hanna" variety is the earliest, next come "Probstei" and "Golden Melon", which can also be cultivated in this part of Hungary, but "Hofbräu" is too late to be grown profitably.

The comparative experiments in cultivation and manuring are shown in Table II.

It will be seen from this table, that the yields were increased by the use of fertilizers, that a nitrogenous fertilizer increased the protein content (a good brewery barley should not contain more than 9 per cent of protein) and that nitrate is only injurious in this respect if by means of the application of this fertilizer, the soil contains an excess of nitrogen in proportion to the potash and phosphoric acid present. Nitrate used alone increases the protein content 1.69 per cent, if superphosphate is applied at the same time, the increase is only 0.39 per cent.

27 - **Rice Culture in the Philippines.**

CONNER, CHAS. M. and MACKIE, D. B. *Government of the Philippine Islands, Department of Public Instruction, Bureau of Agriculture*, Bulletin No. 22, pp. 40 + XXII plates. Manila, 1912.

In the Philippine Islands during the fiscal year 1911, 1 043 757 hectares (2 579 228 acres) of land were cultivated in rice, producing 882 794.13 metric tons (1 945 677 976 lbs) of rough rice (palay). The area cultivated in rice is 94.5 per cent of the total areas cultivated in abacá (*Musa textilis*). coconuts, sugar, corn, and tobacco. The crop is valued at £6 220 755 ($ 30 897 795) representing 65.9 per cent of the total value of the above named crops. Counting the population at 8 886 314 there is one hectare (2.47 acres) of rice cultivated to every 8.5 persons.

The following table shows the area cultivated, total yield, and average yield, and average yield per hectare.

Table No. 1. Rice Crop in the Philippine Islands.

Fiscal years	Total area cultivated (hectares)	Total amount of rough rice produced		Average per hectare	
		Metric tons	Equivalent in cavans (1)	Kilos	Equivalent in cavans (1)
1909	1 156 105	747 942.69	17 394 016	646.95	15.05
1910	1 192 141	810 940.70	18 859 086	680.24	15.82
1911	1 043 757	882 794.13	20 530 096	845.49	19.67

(1) The people throughout the country measure rice by the cavan, the average weight of which is 43 kilos (94.6 lbs) for rough rice (palay) and 57.5 kilos (126.5 lbs) for cleaned rice.

Rice seems to grow well on almost any of the different types of soil. The only essentials are that the soil be fairly fertile and that it have a layer of impervious clay beneath.

At the present time the great majority of rice growers depend upon rain water for growing their crop. As a rule only one rice crop is grown, which is planted at the beginning of the rainy season. The rice-growing provinces may be divided into two groups, those that have a pronounced wet and dry season, and those that have their rainfall distributed more or less throughout the year. Most of the former are located within the Plain of Luzon; and the latter are near the Pacific coast or towards the south. It is estimated that it takes at least 100 to 116 hectare-centimeters of water to grow a normal rice crop, provided it is evenly distributed over the growing season. The average rainfall for the five rice-growing months (June-October) in those provinces having a pronounced wet and dry season is 1556 millimeters. In such localities irrigation is destined to play a great part in rice growing: firstly because rice can be planted at the best time for its development, and secondly, two crops may be grown each season.

About 50 587 hectares (125 056 acres) are now under irrigation; 485 640 hectares (1 200 065 acres) may be easily brought under modern irrigation. This work is going forward rapidly.

About four-fifths of the rice grown is transplanted. One-twentieth of the area to be planted is required for the seed bed. In some sections where water is less scarce two crops of rice are grown each year, and the second or short-season crop is sown broadcast.

Weeds and grass do not give much trouble in those sections where there is a pronounced dry season and where irrigation water is not available. The rice is harvested about the close of the rainy season and the fields are used for pasture during the rest of the dry season.

Cases may be cited where large areas have been grown in rice for at least one hundred years and still produce good crops without the use of fertilisers.

Upland rice is sown on the hills and, as a rule, on new land. The rainfall is depended upon for moisture. The rate of seeding is about 64.5 kg. per ha. (57.6 lbs per acre). The average yield from upland rice is not more than one-half that of transplanted rice, nor is the quality considered as good. If the stand is not even, weeds and grass give considerable trouble. The same varieties may be used for this method as for the caiñgin method; this consists in burning the underbrush and trees on the hills and sowing the rice in holes, without ploughing, when the rains begin; the land is not planted a second time but allowed to cover itself with young growth for three or four years' when it may be cut over and used again. Crops of rice grown in this way may exceed in yield crops grown in the regular way.

There are a few localities where a short rotation is practiced; for example, in sections of Tarlac and Pampanga sugar cane is rotated with rice. In some parts of Laguna and Batangas corn is rotated with rice to good advantage. In many sections mungos are planted on the rice fields during the dry season.

The following is the estimated cost of production of 1 hectare (2.47 acres) of rice according to 230 answers to an enquiry made by the Board of Agriculture.

Estimated cost of 1 *hectare,*

Preparation of seed bed	P. 2.25
One cavan of seed (when sown breadeast 1 ½ cavans)	» 2.50
Plowing one hertare — one man and carabao (1) 10 days at P. 1.25 per day	» 12.50
Harrowing and putting in order for transplanting: one man and carabao eight days at P. 1 25 per day	» 10.00
Transplanting: twenty women and children at P. 0.40 per day	» 8 00
Cost of harvesting and threshing	» 21.50
Total estimated cost	P. 56.45 (2)

When the crop is harvested on shares, the harvesters get from one-fourth to one-tenth, depending upon the condition of the crop, but the general average seems to be one-fifth.

When the land is rented and the farmer has his own work animals, plows, etc., the owner of the land gets from one-third to one-half the crop. If the owner of the land furnishes the animals, plows, etc., the farmer gets one-fourth.

Threshing is still done in most localities by tramping out with the feet, pounding with a flail, or tramping with carabaos. However, steam threshers are being used more generally each year in the large rice-growing districts.

One hundred kilos rough rice, or palay, will give about 65 kilos of cleaned rice. Much of the rice that is used locally is cleaned by pounding in a large wooden mortar. But there are a number of large rice mills in the Islands properly equipped for making good marketable rice. There are also some two hundred and fifty small mills requiring engines of 6 or 8 horse power to operate, which clean rice for local use. There are only two grades of by-products: "binlid" or broken rice and "tiqui-tiqui" or rice bran.

Of the 910 varieties of rice collected by the Bureau of Agriculture of the Philippine Islands, 452 were found to be lowland and 458 upland; 134 of the lowland and 6 of the upland were bearded. The detailed results of variety tests are shown in a number of tables. The earliest lowland variety matures in 118 days; the latest in 209 days.

Except for making the planting and harvest fit in with the average weather conditions there is no occasion for growing a variety that requires more than 150 days to mature.

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(1) Buffalo of the Malay Archipelago. (*Ed*).

(2) 1 P. = $ 0.5 = 2s 0.16d.

The average yields of the lowland varieties tested were as follows:

White, non-glutinous, beardless varieties:
33 or 20.6 % gave less than 1000 kilos of palay per hectare.
58 » 36.2 » ranged between 1000 and 2000 kilos of palay per hectare.
69 » 43.1 » » » 2000 » 3400 » » » » »

White, non-glutinous, bearded varieties:
5 or 4 % gave less than 1000 kilos per hectare.
66 » 53.6 » ranged between 1000 and 2000 kg. per ha.
52 » 42.3 » » » 2000 » 2800 kg. per ha.

Red, non-glutinous, beardless varieties;
6 or 12.7 % gave less than 1000 kg. per hectare.
19 » 40.4 » ranged between 1000 and 2000 kg. per ha
22 » 46.8 » » » 2000 » 3000 kg. per ha.

Four hundred and fifty-eight upland varieties were tested; the data relative to 25 of them are tabulated. The earliest of these matures in 126 days; the latest in 141; the yields varied from 2665 to 4554 kilos of rough rice (palay) per hectare, being, on the average, higher than those for lowland. One explanation for the short range in the ripening period of the upland varieties is that they tend to mature as soon as the rains stop. Four varieties were found which have the grains arranged in bunches of three, much after the fashion of wheat, which is rather unusual. Unfortunately all of these have very dark or black grains which render them unfit for general use.

Rice pests. Rats have been the most numerous and destructive of all pests. Four distinct species have been found, a large brown rat, probably *Epimys norvegicus* Erxleben, being the most numerous.

Birds. — In some districts seed-eating birds often are very destructive, the "mayas" *Munia jagori* Martens, and *Uroloncha everetti* Tweed (Ploceidae) being the most numerous. Two ducks, *Anas luzonica* Fraser and *Dendrocygna arcuata* Horsf., are also destructive; the former seems to prefer fresh water streams and the latter the salt water "esteros."

Insects. — The rice is subject to the attacks of: 1) locusts; 2) moth borers spending the larval stage within the stem (*Schoenobius punctellus* Zell. and perhaps other species); 3) rice-worm (*Spodoptera mauritia* Boisd.), often parasitized and held in check by Tachina flies; 4) rice butterflies (*Melanitis ismene* Cram., — a Nymphalid, and an undetermined species of Hesperid) feeding upon the leaves of the growing rice; 5) rice bug (*Leptocorisa acuta* Gem.) sucking the juice from the ripening grain; 6) rice weevil (*Calandra oryzae*) often found in stored palay and also crawling about on the ripening heads of grain.

Fungi. — A smut, identified by Merrill as *Ustilago virens*, has been found on upland rice at Lamao, Bataan Province. Another species very much like *Ustilago virens*, but with brown or sooty spores, was noted by Mr. D. B. Mackie on rice growing on Catanduanes Island. Rusts have been reporteed from various sections, but they rarely do any damage.

28 - The Branching Habits of Egyptian Cotton (1).

FIBRE CROPS.

MC LACHLAN, ARGYLE: *U. S. Department of Agriculture. Bureau of Plant Industry,* Bulletin No. 249, pp. 28 + 3 plates. Washington, 1912.

The excessively large size of the vegetative branches or limbs on Egyptian cotton plants grown under irrigation in the Colorado River Valley in Arizona and California occasions difficulties in cultivation and harvesting, and causes the development of normal fruiting branches to be postponed. To place the growing of Egyptian cotton in the Southwest on a practical basis, cultural control of the production and development of vegetative and fruiting branches must be established. A study of the branching habits of Egyptian cotton is necessary as a preliminary investigation of this problem.

The present paper gives the results of investigations of the branching habits of Egyptian cotton carried out in Arizona and in Colorado during the seasons of 1909 and 1910. The following conclusions are reached:

" The Egyptian cotton plant bears two kinds of branches, long vegetative branches on the lower part of the stem, which bear no flower buds directly, and above these, to the top of the plant, shorter fruiting branches which bear flower buds.

The differences between vegetative branches and fruiting branches are very sharp: 1) Vegetative branches usually approximate the length of the main stem, while fruiting branches are about one-third as long. 2) Vegetative branches bear no flower buds except as they produce secondary fruiting branches. Fruiting branches bear a flower b d at each node opposite the leaf. 3) The vegetative branches, like the axis, bear fruiting branches and may bear vegetative braches. The fruiting branches rarely bear fruiting or vegetative branches.

Vegetative branches may be either axillary or extra-axillary. Normal fruiting branches are always extra-axillary. Single bolls or short fruiting branches are sometimes developed from buds in the axillary position, at nodes bearing fruiting branches. Such branches may be regarded as secondary fruiting branches borne by the axillary vegetative branch, which is itself suppressed.

From 6 to 8 vegetative branches are usually produced from the first 10 nodes of the axis. At the next 2 or 3 nodes the buds frequently remain dormant or are abortive, and above these a fruiting branch is produced at each node. Under conditions of great luxuriance extra-axillary limbs occur at some of the lower nodes which would bear fruiting branches if the development of limbs was restricted. The length and number of vegetative branches largely determine whether the plants are bushy and spreading or upright. The control of the production of vegetative branches—that is, of the stature of the plant—is necessary because of the desirability of small plants in cultivation and harvesting.

Egyptian cotton when planted late apparently develops more numerous vegetative branches than when planted early. Early planting is therefore advisable as a means of restricting the development of vegetative branches.

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(1) See No. 497 *B*, March 1912. *(Ed.)*.

Abortion of early fruiting branches on both axis and large limbs is common in a greater or less degree to all stocks grown from imported seed. Even the Arizona acclimatized plants frequently abort their lowest fruiting branches. Some of the selected acclimatized types of Egyptian cotton originated in the United States bear fruiting branches at lower nodes on the stem than the stocks of imported Egyptian cotton. Selection for low fruiting gives promise of being a practical means of increasing earliness and yield. Of the six Egyptian varieties grown in Arizona in 1909 from imported seed, Nubary most nearly resembled the acclimatized stocks in putting out fruiting branches at comparatively low nodes of the stem.

A method of recording branching habits of cotton by means of diagrams has been devised (Reference to the original publication is made for description of them). The diagrams show the location of branches, the development of fruiting branches, and the stature of plants. Such diagrams promise to be of value as records in the cultural and breeding study of cotton.

Preliminary experiments in «topping» young plants have resulted in stimulating the growth of buds in the axils of cotyledons. Branches just below the point where the plant is topped make an excessive vegetative growth and tend to assume an upright position in place of the severed axis. The topping of nearly mature plants to hasten the ripening of fruit has not yet been adequately tested.

Egyptian cotton plants grown on soil containing a considerable quantity of alkali restrict the development of limbs and reject their early fruiting branches.

Differences in the branching habits of the different Egyptian varieties grown from imported seed are not sharply defined, because of the diversity within each variety, and hence cannot at present be used to distinguish one variety from another.

SUGAR CROPS.

29 - Cultivation Experiments with Dried Seeds of Sugar-Beets in Hungary.

JANCSÓ, B. Anbauversuche mit vorgetrocknetem Zuckerrübensamen in Ungarn. — *Oester- Ungar. Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XLI, Part 5, pp. 691-697. Wien, 1912.

Hastening the first developmental stage of the sugar-beet is now recommended as the best protective measure against the attack of root-rot, and to attain this end, different methods are adopted, such as husking, previous soaking of the seeds, manuring the rows, and finally, drying the seeds before sowing.

The last treatment is recommended by D. Hegy, Director of the Royal Hungarian Experiment Station for Vegetable Pathology and Physiology at Magyaróvár. The preliminary experiments in the laboratory showed that drying the beet-seeds had the effect of hastening the germination and the first developmental stage of the beets; therefore the Royal Hungarian Agricultural Experiment Station of Magyaróvar, together with the above-mentioned station, determined in 1911 to induce practical agriculturists to make experiments with dried seeds of sugar-beet. Two varieties of Kleinwanzleben from different sources were selected. The half of both varieties of seed was dried at 45°C. until the original water content was decreased from 14 or 15 per cent to 6 to 8 per cent. The other half of the seeds served as a control and was not treated before sowing.

The drying process improved the germination properties of both varieties; of 100 " seeds " 83 undried seeds germinated, giving 183 seedlings, while 87 dried seeds germinated, producing 213 seedlings. The second experiment: of 100 undried eeeds, 91 germinated with 220 seedlings, and of 100 dried seeds, 96 produced 275 seedlings.

The experiment with dried and undried seeds was carried out on 48 farms in Hungary in parallel strips each of at least about half an acre. The opinion of the experimenters was not unanimous. In 14 cases out of the 32 experiments on which reports were sent in, the effect of drying the seed was favourable, and only in one case did this treatment have an injurious action on the development of the plant. In the 17 other cases no special effect on germination was produced by drying the seed, not even where root-rot made its appearance.

The yield was ascertained on 30 of the separate experiment plots. The topped beets per acre were on an average as follows:

I. Undried seeds	264.9 cwt.
Dried »	272.1 »
II. Undried »	276.9 »
Dried »	283.3 »

The sugar content of the beets was tested, but there was no decided or consequent difference between the beets grown from dried or undried seed.

Although the above experiments, which only lasted for one year, give no decisive result as to the efficacy of drying beet-seed, they show that, under certain conditions, intensive drying of the seeds can have an accelerating effect on their germination and the development of the plants. In order to obtain still further light on the question, the experiments will be continued by the Experiment Station.

30 – A Contribution to the Question of Changes Occurring in Sugar Beets during Storage.

FRIEDL, GUSTAV. Ein Beitrag zur Frage der Veränderung der Zuckerrübe während der Aufbewahrung. — *Oesterreichisch-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XLI, Part 5, pp. 698-712. Wien, 1912.

Theoretical investigation has already often occupied itself with the question of the changes which sugar beets undergo in store. Most of the researches, however, dealt solely with the sugar, and the other substances were neglected; but it is just these dangerous producers of molasses, which play a large part in sugar-manufacture. In order to investigate this matter, in the autumn of 1910, sugar-beets were collected and stored in clamps on the experimental field of the Experiment Station of Magyaróvár in such a manner that weekly samples could be taken for the purposes of analysis.

The writer gives in tables the results of this experiment. Other tables give data relating chiefly to the weight, amount of sugar, and quotient, which have been supplied by Hungarian sugar-factories. Reference is also made in this paper to the works of Proskowetz, Marek, and Bruckner dealing with the decrease in sugar content during the storage period, and the writer gives the following summary of his own investigations:

It must be considered as an established fact, that the sugar content of beets decreases greatly during the time the latter are in the clamps.

A portion of this apparent relative decrease is due to the large amount of water which is taken up, causing the juice to become diluted.

The absolute, or real, sugar loss is brought about by the respiration processes of the living roots.

This loss can be avoided through interrupting the vital activities of the beets, which may be effected either by allowing them to freeze, or by drying them. These methods can naturally not be adopted by the manufacturer and recourse must be had to a different kind of clamp The sort to be preferred is one which with the least means will keep the roots at the lowest possible temperature. The loss of saccharose by means of respiration is caused by the formation of invertose as an intermediate product. The formation of the invert sugar is however a very lengthy process, but nevertheless, is more rapid than its consumption by respiration, thus in time it accumulates. The intensity of respiration depends entirely upon individual properties, but it is also influenced by external influences like temperature and the supply of air.

The stability of the nitrogenous compound is a great contrast to the instability of the saccharose. Until the late spring, the total nitrogen content suffers no absolute diminution. At the end of the storing time, the albuminous compounds alone split up into simples bodies. This fact has an unfavourable action on the ratio between sugar and molasses, and the quotient sinks.

The glutamin present seems chiefly to have increased, from which it may be deduced that beet albumen is rich in glutamic acid. The glutamin present in the autumn does not change into glutamic acid, though a similar alteration was stated by Scheibler to occur in the case of asparagin.

No noticeable difference was found in the autumn and spring betain content.

31 - Rubber in Casamance, Senegal

ETESSE, Le Caoutchouc en Casamance, Senegal. — *L'Agriculture pratique des pays chauds*, Year 12, Nos 114 and 115, pp. 231-238 and 310 and 315. Paris, Sept-Oct., 1912.

Casamance, which is a long strip of land bordered by Gambia on the north and Portuguese Guinea on the south, is especially rich in lianas and other rubber yielding plants. Rubber is one of the chief articles of export from Senegal, which country exported in 1910, 737 726 lbs. of this product, worth about £87,000. Senegal may be divided into two districts as regards rubber production : Senegal, properly so-called, *i. e.* the district between the river of that name and the frontier north of British Gambia, which produces and exports principally pea-nuts; and Casamance, where rubber is most produced and exported.

The exportation of rubber, which from 1895 to 1905 rose from 50 010 lbs. to 883 656 lbs., has decreased during the last few years, and the writer has set himself the task of investigating the possibilities of mantaining the present important position occupied by rubber in the trade of the country. To this end, he sets forth the present conditions of its production.

I. *Rubber from wild lianas.*

Although some small plantations of rubber trees exist, it may be said that all the rubber exported at the present time comes from the wild lianas, which grow in nearly all the forests of Casamance.

They belong to the genus *Landolphia* and the most common species is *Landolphia florida* which, however, is neglected by the natives on account of the inferior quality of its rubber. This plant is known to the Europeans under the name of « false rubber liana » and to the natives as « mad », « mantianpo », and « foufoufole ». The Casamance rubber is furnised by *Landolphia Heudelotii, L. senegalensis* and *L. tomentosa*; the latter seems to be preferred by the extractors, and is called « toll », « tolè », or « torè ».

These lianas are not found now, as formerly, in all the forest. They have disappeared before the knife of the « manjacque » or rubber collector, and there remain only three large rubber districts, those of Bayotte, Balante and Fogny. Until lately, the natives extracted little rubber from them, but they were very particular, that no stranger should come and tap their trees and thus these stands have been preserved.

Collection of the latex. — The latex has only lately been collected by the natives of Casamance, and hitherto only by those of British Gambia and Portuguese Guinea, the « Akus » and the « Mandiasos » or « Manjacques ». The first are intelligent and careful; they usually tap the lianas and obtain, by means of coagulation with lemon juice, a very pure rubber, which is now little found in Casamance, « aku prima », known on the European markets, by the brand A. P. The second are careless, quarelsome and overbearing, they care nothing for the preservation of the lianas or for the production of first quality rubber, and the natives are obliged to defend themselves against these invaders and to proceed themselves to obtain the rubber. They tap the lianas by means of incisions, which are made too close together and, coagulate the latex at once by watering the incisions with salt water, with which they also wash the wounds made on the lianas. The rubber thus presents the appearance of large drops, or more or less elongated filaments, which the Manjacques roll into a ball. In the evening, they plunge this into water, or place it under ground; next day, it is taken out and fresh rubber added to it till it reaches the required weight. Then some rubber is rendered soft by means of putting it into boiling water and fashioning it into bands of some centimetres in width, which the native rolls round his ball and which give it the appearance of having been made entirely in this way. The ball is again plunged into water, where it remains until it is sold to the trader, who receives it dripping and still retaining its pink colour.

The aborigines adopt much the same method as the « Manjacques » and it is difficult to say which prepares the rubber best.

The cost price of tapping is calculated by reckoning that a man collects 26 to 33 lbs. of rubber per month, *i. e.* about 1 lb. per day. Experience has shown, that at the time when the liana is distended with sap, a Manjacque can without much difficulty obtain 2.2 lb. of rubber a day, but during the bad season he can only get 9 to 13 lb. per month.

Preservation of rubber and trade.

The rubber obtained is preserved in water or in the ground till the time of sale, which is thus deferred till the fall in price is over. Before accepting the rubber, the trader cuts the balls into two or four pieces to assure himself that they do not contain sand or earth. The purchaser puts the rubber once more into salt water, where it remains till it is exported, when the rubber is packed in casks while still damp. This method of preserving rubber is peculiar to Casamance and influences the price of the product; in Portuguese Guinea, on the contrary, it is kept dry after it has been smoked. Rubber kept always moist tends to become more sticky and to lose its resilience; sometimes it even putrefies.

Four trade marks are recognized in Casamance.

A. P. « Aku prima ».
A. « Aku ».
A. M. « Average Aku ».
B.

The A. P. quality has almost disappeared, and A. is now considered the best; after this comes A. M., which does not contain earth, and B. which, besides various other impurities, contains also sand and even mud. In any case, it appears that A. alone is absolutely free from earth, so much so, that firms which furnish this quality are exempt from the risk of fluctuations in the market and can always sell it under the most advantageous conditions; while the qualities. A. M. and B. are often neglected when prices fall.

II. *Plantation rubber.*

Rubber from the plantations is always preferred in international trade; it is natural therefore, that, in addition to the measures which have been suggested to encourage the production and facilitate the exportation of quality A., the question of planting rubber trees should also have been considered.

In 1895, a nursery of Ceara (*Manihot Glaziovii*) was made at Sedhion and, in view of the threatened disappearance of rubber lianas, it was contemplated using Ceara, as a certain number of seeds and of plants existed on the spot.

Ceara.

These trees multiply very rapidly, but unfortunately their prolificness is counterbalanced by the injury caused by the forest fires due to the carelessness of the natives. The Ceara must be some years old before it can resist fires, so that the species seldom passes the limits of the forests.

Few reliable data exist as to the best age for tapping and on the yield of rubber, as well as regarding the best system of operation. It seems, that an adult tree gives from 8 ½ to 10oz. of rubber per tapping and in the dry season between January and June, a collector does not obtain above 8 ½oz. a day. In these districts, the Ceara comes into leaf in July, and the tapping done from July to January would be more lucrative than that undertaken during the dry season when the incisions cicatrise badly, owing to the hot east winds, and sometimes bring about the death of the tree. Thus the winter tapping is best.

The operation should be carried out by means of horizontal or vertical incisions, but fish-bone or V shaped cuts must be avoided, as they are injurious to the tree.

Other rubber trees.

The Ceara is not the only rubber tree which thrives in Casamance. Experiments made at Martinique with *Funtumia* seem to show that this tree also could be advantageously grown; it is very hardy and would resist the scorching winds well, its bark being less delicate than that of Ceara; further, its general appearance and greater supply of latex are also advantages over the latter tree. The observations made at the Agricultural Station of Mangacunda seem to confirm these views.

Funtumia and Ceara are trees suitable to averagely damp districts; but in plantations of some extent, inequalities of the ground are to be met with, where during the winter rains actual swamps occur; in these *Ficus elastica* can be planted with advantage. As for *Hevea brasiliensis* and *Castilloa*, it can only be said that the experiments made at Mangacunda do not appear to be conclusive.

VARIOUS CROPS

32 - Instructions for Experimental Tobacco Growing.

FILIP. Essai de culture de Tabacs. — *L'Agriculture pratique des Pays Chauds*, 12th Year, No. 115, pp 327-330. Paris, October 1912

In order to assist all those who desire to try cultivating tobacco in the colonies, the Colonial Garden of Paris has asked for and obtained a series of instructions, drawn up by the International Commission of Colonial Tobaccos, of which the following is a summary:

Conditions for the production of light Tobaccos.

a) *Selection of varieties.* Those varieties that in their country of origin possess a low nicotine content.

b) *Soil.* Light permeable soils without permanent moisture are to be preferred.

c) *Manures.* Nitrogenous manures stimulate greater development of the leaves, greater thickness of the tissues and higher nicotine content. Potash on the contrary produces finer and more pliable tissues.

d) *Density of Plantation.* The nicotine content is lower the closer the plants are to each other. The weight of the crop increases with close planting. Experiments made at the Colonial Garden in 1911 have shown that the weight of the crop increased by 60 per cent when 17 000 plants were grown on an acre instead of 8 500. For the production of light tobaccos it is therefore profitable to increase the number of plants per acre.

e) *Number of leaves.* The nicotine content is in inverse ratio to the number of leaves, while the weight of the crop is in direct ratio, reaching a maximum between 15 to 20 leaves.

Conditions for the production of combustible tobaccos.

The variety is to be determined by trials of the combustibility of the leaves, and the soil that is selected must have sufficient assimilable potash; if it should be deficient in potash, this element must be added. For the reasons given above, if a heavy crop of tobacco with low nicotine content is desired, it will be necessary to ascertain by experiments with each variety which are the optimum conditions of closeness of planting and of number of leaves, on the plan given below:

	Distance between the plants	Plot No.	No. of leaves per plants
The same variety	24 × 32 inches = 8 500 per acre	1	10
		2	15
		3	20
	24 × 20 » = 13 300 per acre	4	10
		5	15
		6	20
	20 × 16 » = 20 200 per acre	7	10
		8	15
		9	20

These figures hold good for Maryland, Burley, light Kentucky and other fine leaved varieties, Sumatra, Java, etc.

Conditions for the production of Nicotine Tobaccos.

According to experiments conducted in France it appears that the maximum of nicotine for a given area is obtained under the following conditions:

1. Leaving 6 or 7 leaves per plant.

2. Setting the plants at such a distance as to cover the soil without the leaves injuring each other. With the Lot variety this has been obtained by 8 100 plants per acre, with Sufi 12 100 per acre. The density of the plantation varies with the vigour of the plant, the climate and the soil. Experiments may therefore be made on the following plan

Plants per acre	Plot No.	No of leaves per plant
—	—	—
4 050	1	5
	2	7
	3	10
8 100	4	5
	5	7
	6	10
12 150	7	5
	8	7
	9	10
24 300	10	5
	11	7
	12	16

The subsequent cultivation is the same as for the fine tobaccos, only the pinching off of the side shoots requires special care.

33 - The Coffee Plant in Arabia.

PILLON, J. Le Caféier en Arabie. — *L'Agriculture pratique des Pays Chauds*, Year 12, No. 115, pp. 331-333. Paris, Oct. 1912.

The type-species *Coffea arabica* is the origin of four varieties, which have very different and transmissible characters and are all cultivated in the Yemen. These are:

1. "*Matari*," a plant with very small berries, which is cultivated between the towns of Menakha and Souk-el-Khemis, at an altitude of about 2 000 feet; this is the most renowned of the Arabian species of coffee.

2. "*Haini*." This much resembles the latter, but has larger berries.

3. The "*Kérési*" and "*Cohlaru*" varieties yield very good berries, but their quality is inferior to that of those borne by "*Matari*."

The Yemen includes two very different districts, both as regards the nature of the soil and the climate. From the shores of the Red Sea to the mountains of Central Arabia there extends a vast sandy desert belt about 62 miles wide, called the "Theama," consisting of recent alluvium, which surrounds the second district. This has a warm-temperate climate and is remarkably productive. The temperature here varies from 14 to 26°C. in the day and drops to 22°C. at night during the summer. In winter, the thermometer drops to —1 and —2°C. at night, and rises in the day to 29°C., a higher temperature than it reaches in summer. The irregular rainfall amounts annually to from 800 to 2 000 mm. (32 to 80 inches). In this district, coffee plants are cultivated on terraces, which extend in steps from the base of the valleys to the highest summits. The natives have used all the primitive means at their disposal to retain the water and supply the soil necessary for the plants. The areas of these terraces necessarily vary according to the height at which they are made; the largest may be from $^1/_8$ to $^1/_7$ of an acre; there is about one coffee plant per square yard. The coffee plants are cultivated at between 4 000 and 6 600 ft., in large and deep ravines sheltered from the wind. These clefts are a characteristic of the geological formation of the mountains.

The coffee plants are given no manure; sometimes, when it is possible, the native irrigates the plantation, but more usually, he digs basins around each stem; these are united by a channel, in order to utilise and equally distribute the rainwater. The coffee plant is never pruned; the native merely ploughs the entire terrace before the awakening of vegetation and replaces the soil when the rain washes it away. The bad state of the plantations and the little care given to them cause the crop to be much inferior to that which could be obtained by systematic cultivation. The harvest takes place in December, and after a short preparation the coffee is transported on camels to Hodéidah, or to Aden, where Europeans prepare it for exportation to Europe. A shrub called "Gath" is sometimes cultivated together with the coffee plant; the young leaves of the former are used for chewing and contain small glands, which secrete a sugary liquid with excellent properties due to the presence of an alkaloid, which is probably analogous to cocaine.

FRUIT-GROWING.

34 – A Table Summarizing the Properties of the Different Vine Stocks of adapting themselves to Different Soils.

BURNET, J. Tableau résumant les facultés d'adaptation des differents porte-greffes aux differents terrains. — *La Petite Revue Agricole et Horticole*, Year 18, No. 430, p. 247. Antibes, November 10, 1907.

Nature of the Soil.	*Suitable varieties.*
Non-calcareous soils, provided they are not too dry, or shallow, or too damp, limit of lime 20 per cent, rather light, or semi-light.	Riparia Gloire de Montpellier.
The same soils, but dry, though not exclusively so, limit of lime 15 to 20 per cent.	Rupestris × Cordifolia 107-11. Cordifolia × Riparia 125-1.
The same soils, not excessively dry, lime limit 20 per cent.	Riparia Grand Glabre, Rupestris × hybride Azémar 215-2, Aestivalis × Riparia 199-16.

Nature of the soil.	*Suitable varieties.*
Same soils, not excessively dry, lime limit up to 25 per cent.	Riparia × Rupestris 11 F, Riparia × (Cordifolia × Rupestris) 106-8.
Same soils, not excessively dry, lime limit 25 to 30 per cent.	Riparia × Rupestris 101-14. Rupestris × Riparia 75-1. Rupestris × Riparia 108-103. (Cinerea × Rupestris de Grasset) × Riparia 239-6-20. Riparia × Rupestris 101-16.
The same soils, not excessively dry, lime limit 30 to 40 per cent.	Riparia du Colorado..
Ground with stones and soil mixed, provided they answer to the following conditions.	
Soils apparently dry but deep, being neither damp nor dry, especially as regards the sub-soil. Having good warm exposures-slopes.	*If they have not more than 20 to 25 per cent. of lime* Rupestris Martin, Rupestris du Lot. *With 30 to 40 per cent. of lime.* Rupestris du Lot. Berlandieri × Riparia 420 A. Berlandieri × Riparia 420 B. Chasselas × Berlandieri 41 B.
Heavy soils, which cake, argillaceous, containing on analysis a large proportion of fine sand (which occurs in the case of many soils of glacial clay). Lime 20 per cent.	Riparia. Riparia × (Cordifolia × Rupestris de Grasset) 1068. The last may be tried up to 25 per cent.
Lime 25 per cent.	Riparia × Rupestris 101-14. Riparia × Rupestris 101-16.
Lime 25-35 per cent.	Riparia × Rupestris 3309-3306.
Lime 40 per cent.	Aramon × Rupestris, Ganzin No. 1.
Lime 45-55 per cent.	Mourvèdre × Rupestris 1202. Berlandieri × Riparia 157-11. Berlandieri × Riparia 420 A. Berlandieri × Riparia 420 B.
Soils containing more than 55 per cent. of lime, provided that there is no stagnant moisture in the sub-soil.	Chasselas Berlandieri 41 B.
Soils compact, or not, with 25 to 30 per cent. of lime, very damp.	Solonis × Riparia 1616.
Soils very dry to great depths, non-calcareous.	Riparia × (Cordifolia × Rupestris) 1068. Cordifolia × Rupestris 107-11. Cordifolia × Riparia 125.
Soils very dry to great depths; calcareous.	Bourisquou × Rupestris 603. Cabernet × Rupestris 33 A. Monticola × Riparia 554-5.

For some stocks which have not yet been tried in France from the point of view of chlorosis, viz. Riparia × (Cordifolia Rupestris) 1068 etc., the writer fixes a lime resistance limit according to the vine-growing literature of other districts.

35 - The Vineyards of the Cote-d'Or (France).

PACOTTET, P : Les Vignobles de la Côte d'Or. - *La Vie Agricole et Rurale*, No. 47, pp. 562-565. Paris, October 1912.

The department of Côte-d'Or contains the most celebrated vineyards of Burgundy, which produce the finest red and white wines of the world.

The vineyards are divided into four districts: Beaune, 39 500 acres; Dijon, 17 300 acres; Semur, 5 000 acres; Châtillon, 2 500 acres; *i. e.* 64 300 acres of entirely reconstituted vineyards. They form several regions: la Côte, l'Arrière-Côte, Val-de Saône, l'Auxois and le Chatillonnais. Val-de-Saône consists of marly slopes, which overlook the bed of the Saône. With the Melon grape, on the slopes of Ecuelles, Chivres, and Labergement, very good ordinary white wine is produced for drinking when new.

Arrière-Côte is composed of coombes and gullies separating the hills, which form the immediate and highest background of the slopes of la Côte. The latter, l'Auxois and le Chatillonais, districts lying further in the mountains of the Côte-d'Or, produce quantities of red wines from the Gamay grapes and their varieties, the highly coloured Gamays.

Parallel to the Saône at a distance of 12 miles from the river and separated from it by a plain covered with cereals and forests, the portion of la Côte containing the vineyards that produce the finest wines forms an almost straight continuous line of slopes between Dijon and Chagny. These vineyards form a belt from a third of a mile to a mile and a quarter in width which rises to about half way up the slopes (an altitude of from 725 to 900 ft). where they join waste, dry, stony land forming the summits of the hills. The soil is always more than 20 inches deep and is composed of very red vegetable soil, chiefly marl, full of small stones.

In les Romanées, on account of the frequent additions of decalcified soil from the plateaux, which have been repeated for centuries, the vegetable soil reaches a depth of from 5 to 6½ ft. Often two or three supporting walls on the slopes serve as roads and form two or three terraces to keep up the soil.

The subsoil consists of three important stages of the Jurassic: Bajocian, Bathonian and Oxfordian, overlain at times, as at Beaune, with a thick stratum of Rauracien (1) with a corallian facies.

The Côte de Gevrey-Chambertin is on the Bajocian, a hard crystalline limestone. Côte de Nuits is situated on the Bathonian, a fine, hard limestone, while the Oxfordian dominates on the Côte de Beaune, where it has a pseudo-lithographic limestone, or a marly facies. These different geological stages, though all represented by limestones, impart very distinct characteristics to the wines.

Those from the Côte de Beaune, where the lime content of the soil is increased by the marl, are very fine in quality, have much bouquet, and are also very delicate, but they do not keep so long as the more full-bodied wines of Côte de Nuits with their larger amount of bouquet. The wines of Cote de Gervey-Chambertin are a little deeper in colour and have more body than the former.

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(1) A name proposed by Greppin for the "Corallian". (*Ed.*)

All the soils which produce wine of the best quality are deep, the subsoil is always damp and their good chemical composition is shown by the following analysis.

Analysis of the soil of the principal vineyards of Côte d'Or.

Amount of substances determined per thousand parts by weight	Chambertin	Clos-Vougeot	La Romanée	Les Saint-Georges	Bressandes, Beaune	Montrachet
Gravel	104	—	270	167	320	104
Small stones	216	—		253		220
Fine soil	680	—	730	580	680	676
Analysis of fine soil:						
Silica	450	598	509	634	307	337
Clay	460	272	349	102	235	281
Calcium compounds	48	110	59.4	122	318	316
Humus	23	—	—	18.8	—	24.9
Nitrogen	1.68	1.67	—	1.79	—	1.47
Phosphoric acid	2.19	2.68	—	2.14	—	1.03
Potash	3.06	2.81	—	3.87	—	5.20
Magnesia	1.53	1.03	—	1.10	—	traces
Sulphuric acid	traces	-	—	0.08	—	—

Pinot noir, with its colour varieties ranging from "Pinot gris" or "beurot," to "Pinot noir" and its numerous varieties, are the only vines in the large vineyards producing red wine in the Côte d'Or. Formerly from $^1/_{15}$ to $^1/_{20}$ of Pinot blanc Chardonnay was added. The latter is the sole variety cultivated for the production of the famous white wines of Montrachet, and Meursault. In the latter, as it was not very productive, the Aligoté variety was associated with it; this produces excellent wines on the stony or marly summits of la Côte. On the plain, at the foot of the slopes, Gamay varieties give strong, coloured wines, which are rather harsh. This variety is associated in some vineyards with Pinot, or its grapes are mixed in the vat with those of the latter; the resulting wines are excellent and are known under the name of "Passe-tout-grains." The red and white Pinot wines are classed under the heads of "tête de cuvée", "première cuvée," "deuxième cuvée," "troisième cuvée," after which come the "passe-tout-grains," "grands ordinaires," "ordinaires". The two last are Gamay wines.

The vineyard of la Côte is divided into three districts: 1) Côte de Dijon; 2) Côte de Nuits; 3) Côte de Beaune. The Côte de Dijon has no first class vintages. But on the other hand, at Chenôve, Fixin, and Brochon excellent "Passe-tout grains" is made. The Côte de Nuits, of which the Côte de Gevrey-Chambertin is a subdivision, produces the following wines: *a*) at Gevrey-Chambertin: Chambertin and Clos de Bèze (tête de cuvée); *b*) at Morey: Clos de Tart (tête de cuvée); *c*) at Chambolle-Musigny: Musigny (tête de cuvée) the wine of finest quality in all Côte d'Or; *d*) at Vougeot: Clos Vougeot (tête de cuvée); *e*) at Fageay-Echézeaux: Echezeaux (tête de cuvée): *f*) at Vosne-Romanée: Romanée Conti, the most excellent of all the red wines; Romanée, Romanée Saint Vivant, Tâches, Richebourg, all "tête du cuvée"; *g*) at Nuits-Saint-Georges: Saint-Georges, Cailles, Vaucrains, "tête du cuvée."

Besides the great red wines, the Côte de Beaune produces also first class white wines wherever the calcareous marls of the Oxfordian predominate. These include *a*) at Pernaud: Charlemagnes, white and red, the Vergelesse varieties, "tête de cuvée;" *b*) at Aloxe-Corton: the Corton and Charlemagne varieties (tête de cuvée); *c*) at Savigny-les-Beaune: Vergelesses (tête de cuvée); *d*) at Beaune: Grèves; *e*) at Pommard; the Rugier varieties, ("haut et bas," "tête de cuvée"); *e*) at Volnay: En Cailleret (tête de cuvée); *f*) at Meursault: Perrier, Charmes, Genevrières and Gouttes d'Or are all white wines of the "première cuvée;" *g*) at Puligny-Montrachet: Montrachet ainé (tête de cuvée) is grown entirely on the salmon-pink marls of the lower Bathonian; above this, halfway up the slope, Chevalier Montrachet is cultivated in a poor red soil with a stony subsoil, while below it Bâtard Montrachet grows in a deeper, richer soil; further down nearer the plain, it yields remarkable wines "de première cuvée;" *h*) at Chassagné-Montrachet: Clos Saint-Jean (tête de cuvée); *i*) Santenay: Gravières.

The vines were formerly planted thickly, 8 000 or 10 000 stocks per acre; they are now arranged in lines and do not contain more than about 4 000 vines per acre. Layering the vines tends to decrease.

The addition of new soil is now rarely practised, as the system has become too costly, but the vines are given stable-manure, or chemical fertilizers, which was formerly avoided.

The vines are pruned to low stocks with three or four branches; leaving the canes longer, which suits the Pinot variety well, is not practised, as it diminishes the quality of the fruit, though it considerably increases the quantity.

Only a few proprietors pick over their grapes, which are as a rule sound. The wine is fermented in open vats of small volume, 440 to 1760 gallons, after which it is placed in new oak casks, in which it is sold, after having been kept two, three and four years.

36 - Viticulture in the Department of Concordia (Entre Rios, Argentina)

ANZORENA, PEDRO. La Viticultura en el Departamento de Concordia — *Boletin del Ministerio de Agricultura*, Vol XIV, No. 7, pp. 621-636. Buenos Ayres, 1912.

From its geographical situation, the department of Concordia is included in the zone of vine cultivation, but the physico-chemical nature of the soil renders this industry unremunerative at present. Nearly all the vineyards are to be found in the neighbourhood of the town of Concordia and for 8 or 10 years they have not been extended, although the undulating and hilly configuration of the district is very suited to vine cultivation. The soil, which is entirely siliceous, attains a depth occasionally of 1 metre (3 ft 3 in.) and rests upon a clayey or loamy sub-soil, generally of an impermeable character; sometimes the soil and the subsoil are alike in composition.

There is a scarcity of lime, phosphoric acid, and especially of nitrogen in the soil and the vine consequently grows badly and bears little fruit; further, the humidity of the subsoil is very conducive to the development of fungoid diseases, which have all been observed in the vineyards. Thus, it is advisable to alter the physical and chemical properties of the soil by means of drainage and the addition of lime, as well as of organic and mineral fertilizers. On soil thus prepared, hoed crops, or leguminosae must be grown for two or three years; planting should be regular and the system of cultivating and of pruning which is chosen should be adapted to the soil, the climate, and the vines.

Green pruning is advisable as it always tends to ensure a better and larger crop; the weeds should be carefully removed and the soil kept sufficiently damp, but not excessively humid, as it is at present.

So far, only one variety of vine is known in the district viz. "Lorda," which resembles Malbeck and Tannat. This is grown on its own stock, but the practice of grafting on American vines is becoming increasingly common. The Lorda variety is very resistant to fungus diseases, but bears few grapes, so that it would be well to replace it by kinds which would adapt themselves to the climate and soil.

It appears, that preference should be given to white table wines and to red wines for blending. The former could very well be used in the preparation of imitations of Marsala, Port, Sherry, Malaga, etc.

The stocks which are most recommended for the Department of Concordia are the following: Riparia Gloire de Montpellier, Riparia Grand Glabre, Rupestris Monticola, Rupestris du Lot, Riparia Rupestris.

As regards the wine making, the writer states that it is done under the best conditions and according to modern methods.

Sr. Anzorena advocates the creation of experimental nurseries, vineyards and cellars.

37 – Report on Fruit Culture in the School of Practical Agriculture at Wagnonville.

PINELLE, M. Rapport sur les cultures fruitières de l'Ecole Pratique d'Agriculture de Wagnonville. — *Journal de la Société Nationale d'Horticulture de France*, Fourth Series Vol. XIII, pp. 656-659. Paris, October, 1911.

The following report was drawn up by the writer subsequently to the visit paid by the members of the commission of the National Horticultural Society of France for the purpose of examining on the spot the pruning operations carried out upon fruit trees and especially pear-trees, by M. Lorette, Cultivation Director at the School of Wagnonville (Nord).

The soil of the school gardens is clayey or loamy to a depth of 20 to 23 ft.; the arable stratum has been much inproved to a depth of 16 to 20 inches. The trees are vigorous and receive a liberal annual dressing of manure. All the pear-trees are grafted on quinces.

The shapes used are, in the open, the winged pyramid (with four wings) which is much recommended by M. Lorette as affording the trees most light; the classic shapes are also employed: U and double U, Verrier's palm-leaf, etc.

The pruning methods adopted by M. Lorette, and which have lately attracted much attention, do not completely revolutionize the pruning principles of the so called " three bud " system; but the latter have been greatly modified by him, the most important changes being the accelerated bearing of fruit on suckers and on vigorous fruit branches.

The following is a summary of M. Lorette's methods of pruning.

Leading branches. The leaders of trees in course of being trained are not pruned except when necessary to obtain the different stages or for removing the portion of the branch, which is not sufficiently lignified; this is done during May when vegetative growth is already active and the shoots are an inch or more in length; in cases where the terminal bud has become a flower bud it has nevertheless to be removed.

In the winged pyramid, the first stage is made by one pruning, the branches thus obtained are not shortened, but are placed in the horizontal position and then bent up; they continue to grow up to the top of the tree. The branches of the successive stages are obtained by cutting them back at a distance of 20 inches from the preceding stage, training the branches thus obtained horizontally and bending them up for a length of 8 to 12 inches against the branch coming from below.

For the prolonging of the stem the least vigorous branch should be selected; nearly always the buds growing from the dormant buds are chosen. It is necessary during the vegetation period to free the prolongations of the leaders from all the false buds which are likely to develop, by cutting the latter at a few millimetres from their base.

If there is a want of equilibrium between the various prolongations, this must be restored by removing a third, or a half, of the blade of the leaves growing on too vigorous branches.

In the case of trees which are completely trained, the branches which prolong the leaders are left intact during the vegetative period and throughout the winter. After the sap awakens, in May, they are removed at their base. Choose amongst the numerous secondary buds one which seems the weakest, keep this intact and remove the others; this operation should be repeated every year.

The object of not pruning the leading branches on trees in process of training, is to obtain weak fruit branches, sometimes even only fruit buds; nevertheless fruit branchlets may develop.

Fruits. — Towards the 15th of June, the fruit branchlets of from 10 to 12 inches in length are treated as follows :

1. Those which have attained a thickness of 7 to 8 millimetres and more, are cut back at 8 to 10 millimetres from their point of insertion ; one or more stipular buds develop which can become spurs, or new fruit branchlets.

2. The fruit branchlets which have not attained to the above-mentioned thickness, are cut to 3 eyes ; one or two false buds may develop, which are cut back to 8 to 10 mm. if these are new fruit branchlets ; often they are spurs, in which case they are left intact.

3. The fruit branchlets which develop on the cluster spurs should be cut back to some millimetres in length. On the 15th of July, the second green pruning is done; this consists as before in cutting back to 8 to 10 mm. the fruit branchlets derived from false buds, or stipular buds, and which are 7 to 8 mm. thick. Cut back the weakest to three eyes, or pierce them through with a grafting knife between the 3rd and the 4th leaf.

It would be natural to suppose that the suppression of these buds would cause the spurs to develop into fruit-branchlets and cause a serious perturbation on the growth of the tree. The Commission examined a pear-tree Doyenné d'Alençon from which over 400 buds had been removed on July 15 (second pruning), and found only a few shoots, although the tree was vigorous.

On August 15, a new operation is carried out according to the same system ; in September the shoots on the spurs are cut back and also those on the fruit buds, which latter are thus able to profit by all the available sap. In winter the supernumerary fruit buds should be removed.

By this pruning method M. Lorette considers that he obtains more fruit buds than by the ordinary system; the resulting buds are stronger, and contain 17 or even 20 flowers ; in the event of frost, the flowers in the centre of the inflorescence protect those of the periphery which are placed below them. Further, this method of pruning requires less time.

The members of the Commission were unanimous in declaring that the trees were very vigorous and were regularly covered with fruit branches from top to bottom, the latter being more numerous and shorter than is usually the case ; the number of leaves was consequently larger. Even on the horizontal portions of the branches, above and below alike, fruit or fruit buds were found; no part was bare.

With regard to counter espaliers and non-espaliered forms, the yield was very large and the trees were healthy. The results appeared less satisfactory on espaliers, which bore little fruit.

As M. Lorette himself explained, too many fruits had been left on this year.

The members of the Commission themselves counted: 156 fruits of almost normal size on 7 feet of the branches of Beurré Sterckmans, *i. e.* about 22 to the foot; on 3 ft. 3 in. of P. Doyenné du Comice, 21 fruits weighing about 100 grammes on August 22: on 3 ft. 3 in. of P. le Lectier, 17 fruits were obtained.

To sum up: the Lorette method of pruning seems to give good results, especially in the case of trees in the open; it is more adapted to pear-trees than to apple-trees, and is especially advantageous where the trees are very vigorous; a liberal supply of manure should be given at the same time.

It would be premature to say that the above-mentioned operations are always successful, for all shapes, in all climates, on every soil and with any exposure; it is necessary to experiment, and after some years, when the examples are more numerous, it will be possible to form a definite opinion on the subject.

38 – Is it Necessary to Fertilize an Apple Orchard?

HEDRICK, U. P.: *Thirtieth Annual Report of the New York Agricultural Experiment Station (Geneva, Ontario County) For the year 1911*, Bulletin No. 339, pp. 262-304 + figs. 5-11 + plates XVII-XX. Albany, 1912.
ID.: A Comparison of tillage and sod mulch in an apple orchard. *Twenty-eighth Annual Report of the Board of Control of the New York Agricultural Experiment Station (Geneva, Ontario County) For the year 1909*, pp. 435-490 + plates XXV-XXXI. Albany, 1910.
ID.: Orchard Management. *Ib.* pp. 526-537.
New York Agricultural Experiment Station, Bulletin No. 289.

A problem which remains to be solved is that of fertilizing apple orchards. The current recommendations for fertilizers in orchards are of little value, for few experiments have been made which have furnished accurate data. The methods usually practised are almost exclusively based upon fertilizing field and garden crops., but the requirements of the apple-tree cannot be compared to those of herbaceous plants owing to the great difference in the habits of growth of the two kinds of plants. Fertilizing apple trees is also a difficult question, for besides there being variability of plants and environment to contend with, it is necessary to consider the tree and the future crop.

Four Experiments at New York Agricultural Experiment Station.

With the hope of throwing some light on orchard fertilization, the New York Agricultural Experiment Station has undertaken several experiments. In one of these, the effects of potash, acid phosphate and lime were tested; the second was combined with a test of tillage and sod-mulch; the third is now under progress in a continuation of the orchard management test just mentioned; in the fourth, the fertilization of orchards which are not in sod is studied. This last experiment is of double importance. In the first place, it is the only experiment which has been carried on for a sufficiently long period *viz.* 15 years. Further, as the disturbing influence of the grass has been eliminated, the effect of the fertilizer on the apple trees will be more decisive.

The site and soil of the experiments.

The experiments in question were carried out in an orchard where the soil was a heavy clay loam and had been used for the ordinary rotation of farm crops.

There were 12 plots, each containing 5 trees and separated by single rows of trees not in the experiment. There were four fertilizer plots in duplicate in the experiment and four check plots; the latter were reduced to three.

The fertilizers used were as follows:

Stable manure	plots 1 and 9; average per year	125.15 lbs. per tree
Acid phosphate	„ 2 „ 8 „ „ „	12.66 „ „ „
Muriate of potash	„ 6 „ 10 „ „ „	7.20 „ „ „
Acid phosphate		12.6 „ „ „
Muriate of potash	„ 4 „ 12 „ „ „	7.26 „ „ „
Acid phosphate		12.6 „ „ „
Nitrate of soda		3.67 „ „ „
Dried blood		12.84 „ „ „

It is noticeable, that since the fertilizers were put on only underneath the branches of the trees, a tremendous excess of each was used. This experiment should therefore show whether excessive fertilization is deleterious to trees or not. The trees used were Rome, top-worked on Ben Davis, the Rome buds all having come from one tree, and the stocks were carefully selected in order to obtain an orchard as free from individual variation as possible. The trees in the orchard were amply cross-pollinated.

Results of the experiments.

In gaging the value of the different fertilizers, it is necessary to consider the crop, size, colour, flavour, time of maturity, texture of flesh and the keeping quality of the fruit, and also the diameter of the tree, the colour and weight of the foliage and the length and weight of the annual growth of the branches. It may be said that the experiments did not prove the truth of the current opinion of the effect of fertilizers on apple trees: the yield does not seem to have been larger; on the other hand, the size of the fruit had a tendency to increase, while the percentage of culls was a little higher on the check plots. In any case, the colour, flavour, and keeping qualities were not influenced by the fertilizers. The measurements of the diameters of the tree trunks only showed differences due to ordinary causes of variation.

The most noticeable effects were obtained by the application of nitrogenous manures; the leaves were greener and also weighed more and the annual growth of the branches was increased.

Analysis of the soil also showed that the upper twelve inches of the soil at the beginning of this experiment contained sufficient nitrogen to last apple trees bearing twenty bushels of fruit per tree 183 years and enough phosphoric acid and potash to supply them for 295 and 713 years respectively. Thus as the experiments have shown, with these large reserves all that is necessary is yearly ploughing and thorough cultivation, together with the ploughing under of cover crops.

Commercial fertilizers are therefore little needed, except on sandy and gravelly soils deficient in potash or phosphates and subject to drought, or those of such shallowness or mechanical texture as to limit the root-range of apple trees, or which are too wet, too dry, or deficient in humus. Some apple orchards may require two of the elements, but few should need a complete fertilizer.

A fruit-grower may assume at once if his trees are vigorous, bearing well and making a fair amount of new wood, that they require no fertilizer. If the trees are not in this condition, attention should be paid first to drainage, tillage and the health of the trees, before having recourse to the use of fertilizers. Before applying the latter on a large scale, it is necessary to carry out a fertilizer experiment.

Plan for a Fruit Grower's Fertilizer Experiment.

The fruit grower may determine by a plan adapted from this experiment, what fertilizers his orchard needs. The trees selected should be of the same variety and age, and the soil as uniform in texture and fertility as is possible. There should be a sufficient number of trees in each plot to offset individuality in the former; five is the minimum number that can be used with any degree of accuracy.

On plot 1, use stable manure to supply 50 lbs. of nitrogen to the acre per year. This, on the average, would be about 5½ tons per acre. In an orchard where the trees stand 40 ft. apart, use about 400 lbs. per tree.

On plot 2 use a phosphate fertilizer in sufficient amount to supply 50 lbs. of phosphoric acid per acre per year. A good recommendation is 360 lbs. of 14 per cent. guaranteed acid phosphate per acre, or 13 lbs. of fertilizer per tree.

On plot 3 apply muriate of potash guaranteed 48 to 52 per cent actual potash. Apply 100 lbs. of potash per acre, which would require 200 lbs. of muriate of potash per acre, or 8 lbs. per tree. Combine with the potash the acid phosphate in the amounts prescribed for plot 2.

On plot 4 use a complete fertilizer consisting of nitrogen as applied in plot 1 and of phosphoric acid and potash as applied on plot 3. Or for the stable manure substitute 350 lbs. per acre (13 lbs. per tree) of dried blood with 9-12 per cent of nitrogen, or 100 lbs. per acre (3 $^2/_3$ lbs. per tree) of nitrate of soda. Plot 5 should be a check.

If it is thought desirable to test the influence of lime, duplicate plot 4 with the addition of 25 lbs. of slaked stone lime per tree.

All things considered, the best time to apply fertilizers is the spring, as soon as the ground can be worked. Spread broadcast about the tree over an area slightly larger than that covered by the branches. In cultivated orchards the commercial fertilizer should be harrowed in and the manure ploughed under. If the results are to be at all conclusive, such an experiment should last for several years. The crop should be weighed or measured at harvest time to determine the relative value of the different treatments.

It is not sufficient to keep count of the marketable fruit from each plot; culls and windfalls should be accounted for.

All plans and preparations for such experimentation can be made in the winter, so that the actual work in the spring need not be great.

39 - Promising New Fruits.

TAYLOR, U A. and GOULD, H. P. in *Yearbook of Agriculture for* 1911, pp. 423-438. Washington, 1912.

The following new fruits are described at length, as they are believed to possess a value in the future development of fruit culture, but the Department of Agriculture has no stock of these varieties available for distribution.

1. *Cornell Apple.* — grown by T. O. Duvall, Burtonville, Montgomery Co., Md.
2. *San Jacinto Apple* — grown by Dr. A. M. Ragland, Pilot Point, Denton Co., Tex.
3. *Shiawassee Apple* — grown by H. C., & M. D. Ward, Pontiac, Oakland Co., Mich.
4. *Ayer Pear* — grown by O. H. Ayer, Sibby, Douglas Co., Kans.
5. *Russel Peach* — grown by F. O. Harrington, Williamsburg, Iowa Co., Iowa.
6. *Laire Plum* — grown by E. Bartholomew, Stockton, Rooks Co., Kans.
7. *Monicelt Plum* — grown by R. Bates, Jackson, Aiken Co. S. C.
8. *Pananty Grape* — grown at the Cooperative Experiment Vineyard, Fresno Co., Fresno, Cal.
9. *Thomson Orange* — grown at Riverside, Cal

40 - Remarks on the Coco Palm.

MAIN, F. Considerations sur le Cocotier — *Journal d'Agriculture Tropicale*, Year 12, No. 136, pp. 292-298. Paris, Oct. 30, 1912.

In referring to the two works of H. Hamel Smith and of W. Barrett, which draw attention to the economic value of plantations of Coco palms, the writer gives a rapid review of the most recent publications dealing with the cultivation of these trees. (1) He especially examines the disputed questions (for though the cultivation of the coco-palm is a task of extreme simplicity, the different writers are, nevertheless, not of one mind on this subject), and attempts to show the conclusions to which experts are inclining and to specify the figures which are gradually being accepted.

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(1) Abstracts of a number of articles on the economic importance and the technical problems of this cultivation have appeared in this *Bulletin*: see, amongst others, Nos. 2690, 2691 and 2692 of *B* Aug.-Sept.-Oct. 1911, and No. 1310 *B* Sept. 1912. The last summarizes the most recent researches on the subject. (*Ed*).

Growth of the Coco Palm. — It has often been stated that this tree cannot grow at any distance from the sea, but it has now been proved that it thrives as far as 300 km. (186 miles) inland. The neighbourhood of the sea is, nevertheless, beneficial to this palm, and in the Philippines, for instance, the coast is almost uniformly bordered by stands of coco-trees. On the other hand, the excessive transpiration of the leaves, which in the case of a tree in full growth, can amount to 45 litres (10 gals.) per day, necessitates a climate of sufficient humidity to compensate for the large amount of water lost by this means.

Making a plantation. — After comparing the different estimates and schemes published by various writers, and making allowance for the fact, that during the first 7 years only expense can be looked for, M. Main concludes,that the expense of an area of 2470 acres planted with 100 000 coco palms should be estimated at from £11 4*s* to £16 per acre. It is not possible, at present, to reduce the difference between these two figures, but writers who estimate by the single tree and reckon the cost price of a palm of from 6 to 8 years at 6*s* 2 ½*d* or 6*s* 8 $^{3}/_{4}$ *d*, consider, taking about 40 trees per acre, that the results work out in accordance with the above figures. It seems thus reasonable to fix the capital necessary for making a plantationof 2470 acres with 100 000 coco-palms at from £32 000 to £36 000; necessarily, the sum is not equally divided over the first 7 years.

Selection and Varieties. — Messrs. Barrett, Zaepernick and Smith are not all agreed as to the existence of true varieties for selection and of general rules to be observed in order to improve the production. Nevertheless, it seems certain that the copra yield varies with the district and the cultivation and probably also according to the varieties. About 20 varieties are believed to exist in Malaysia.

Interplanted Crops. — As a rule, the cultural operations are not the subject of much controversy; but on the other hand, the question of associated crops is much discussed. The latter are increasingly planted under certain conditions. The present idea is, that those crops must be selected which give an immediate return, as they can only be planted the second year, and must be given up after the fifth, or sometimes even after the fourth year, in order, that the coco-palm may derive the entire benefit from the nutritive substances present in the soil. The plants most used are manioc, pineapple, pepper-plant, coffee (*Coffea robusta*), mimosa, and various Leguminosae, agave, maize, earth-nut, etc. Amongst the Leguminosae, *Crotalaria* is an especial favourite. *Coffea robusta* is well spoken of also, as from its second year, it is capable of yielding 160 lbs. to 180 lbs. per acre; in the third year the crop exceeds 450 lbs. and is 1800 lbs. the two succeeding seasons. These figures largely counterbalance the cost of plantation and allow of the crop being up-rooted after the fourth year, should the state of the coco palms require it.

It seems the general opinion that coco trees which are manured by grazing live stock yield earlier and larger crops; but the age at which the trees have nothing to fear from the animals is, however, still a moot point, and there are no data available as to the facilities for the purchase and sale of live stock.

Improvements and fertilizers. — It is generally recognized that phosphoric acid and nitrogen are more clearly useful than potash, although the latter is also necessary.

Farm-yard manure is one of the best fertilizers; cakes, organic manures and ground bones are also excellent, as is also especially the green manure consisting of the Leguminosae which have formed the intercalary crop. Common salt, which has been hitherto regarded as a very good fertilizer for the coco-palm, is no longer in favour and it is considered that chloride of potash fertilizers are sufficient.

Yield. — The different writers estimate the number of nuts required to produce 1 ton of copra, at from 4000 to 7000. The divergence between the figures is doutless due to the differences in the weight of the nuts borne by the different varieties which are planted.

Opening and drying the nuts. — There are a few machines for opening coco-nuts, but the writers have, so far, not taken them into account, for the extraction of the kernel by means of an iron rod, or " bolo " is considered almost generally to be the best method, and it is still believed that an excellent quality of copra can only be obtained by drying the nuts in the sun. The drying apparatus are not as yet perfect, but when they work well, they furnish a copra which is preferred by some producers and exporters.

" *Coir* " (*Fibre*). — Hamel Smith's book gives interesting details concerning the mechanical extraction of " coir ", and in particular, a description of little-known machines. The mechanical preparation of " coir " may be considered as an improvement, which permits of its being always utilized, and removes the prejudice according to which it was considered an unimportant byproduct to be collected only when possible:

Diseases and insect pests. — The writers who have been consulted mention rats as being enemies of the coco-palm, in addition to diseases and insects. Zaepernick advises the use of zinc bands to protect the trees from the attacks of these rodents. These bands are used in Europe for fruit-trees, but would be very costly in the case of a plantation of 100 000 palms. O. W. Barret gives an account of the *Coleoptera*, which can only be controlled by collecting them. " Bud rot " is the most serious bacteriol disease from which the cocoa-tree suffers, it appears to be caused by *Bacillus coli*. The only method of control is up-rooting the infected palms and burning them (1).

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(1) On the diseases and enemies of the coco-palm, see amongst other abstracts in this *Bulletin*, those which deal specially with " bud rot " pp. 368, 369 *B.* Dec. 1910. (*Ed.*).

FORESTRY

41 - The Economic Importance to Portugal of the Cork Oak and its Products.

KLEIN (Madeira) — *Naturwissenschaftliche Zeitschrift für Forst und Landwirtschaft*, Year 10, Part 11, pp 549-559 Stuttgart, November 1912

Thanks to its geographical situation, its soil and its climate, Portugal possesses a rich tree flora. The forest timber which exists is mostly indigenous, but trees which have been introduced flourish equally well. Of great importance among the latter is *Cupressus glauca*; this occurs in large stands in Busaco and reaches huge dimensions; *Acacia melanoxylon* and *Eucalyptus globulus* should also be mentioned, and it is the latter which imparts to the Southern Provinces their characteristic note. From the forestry standpoint, Portugal is divided into three districts; the first that of *Pinus pinaster* Ait. (pinheiro bravo), which extends from the Sado to the Minho and from the sea to the mountain chain and is swept by the sea winds. The second district is that of *Quercus suber* (sobreiro) and *Quercus ilex* (azinheiro), these trees here form not very dense forests extending over vast stretches of country, which are called "montados". This region extends from south of the Tagus to the coast of Algarve, and is almost throughout slightly undulating. Its climate is hot and dry, since rain rarely falls here between May and October. The third district is that of *Quercus pedunculata* (carvalho alvarinho), *Quercus tozza* (carvalho negral) and *Quercus lusitanica*, but the latter is of rarer occurrence and prefers the flat central portion, which it shares with *Castanea vesca*. This territory north of the Tagus is in places very mountainous, and the climate is variable and humid; heavy rain occurs, especially in the district between the Douro and the Minho. Until some decades ago, *Pinus pinea* grew in great masses in the valleys of the Tagus and Sado. But there was so large a demand for the wood of this tree for shipbuilding purposes and railroad construction, that the pines were cut down in large numbers and have not been replanted, or even replaced by the less valuable but more rapidly growing *Pinus maritima*. Now the mistake has been seen and this latter species is being chiefly planted.

The Cork Oak. — After *Quercus ilex*, which covers 618 000 acres, *Quercus suber* is the tree most widely grown in Portugal, where it occupies an area of 519 000 acres. The regions where it is chiefly cultivated lie south of the Tagus and indeed principally in the districts of Beja and Evora, in the centre of Pontalegre and in the Province of Algarve; here it often forms extensive closely growing stands. In the Tagus valley, the districts of Lisbon and Santarem and that of Castello Branco, this tree is not so well represented, but it still grows in large stands; these decrease in size towards the north, and finally only solitary individuals occur.

In south and central Portugal, the cork oak shows its usual habit; its stem is normally short and its growth compact, it branches at from 5 to 10 ft. above the ground and forms a spreading bushy crown. In the north, on the contrary, where this species occurs mixed with *Pinus maritima*, its trunk is more slender and often attains a considerable height; but this change of habit is also due to the method of pruning adopted. Here, too dense a shade is avoided, as space is needed for intercalary crops, while in the south, where the cultivation is less intense and the estates larger, more stress is laid upon a greater production of cork and acorns. In the north, the development of horizontal branches is encouraged, which are carefully pruned in order to expose the crown to the effect of light and air.

The flowering and fruiting seasons and the time of the fall of the acorns are at approximately the same dates as in other Mediterranean countries. Sometimes cork oaks attain quite large dimensions. As an example, the writer cites a tree growing in the Estremoz district, which in one season yielded 3960 lbs. of cork. As regards their growth, many young plantations ("chapparaes") yield cork fit for use 23 years after planting, while male cork is produced sooner, but the latter cannot be used in the manufacture of bottle corks.

The acorns are devoted to the fattening of pigs, although they are more bitter than the fruit of *Quercus ilex*. It is estimated that of the million pigs which are reared annually in Portugal, one third are fed on the acorns of the cork oak and holm oak (*Q. ilex*). The total harvest amounts to 200 000 tons. If the proprietor is not himself a pig-breeder, he farms out the oak forest at the rate of from 20 to 25 shillings per head of swine to be fattened. The number of these animals to be fattened in a forest is decided empirically. As a rule, the ground beneath the oaks is kept free from underwood and bushes; this promotes the growth of intercalary crops, obviates any danger of forest fires, and enables the pigs to find the acorns with greater ease. The formation and ripening of the cork is hastened by working the ground, manuring for intercalary crops, and by the pigs during the fattening season. The cork is finest and thickest when it has formed quickest. All existing cork oak forests are of natural growth, and most new plantations that are made arise by protecting a certain area against pigs and fire.

Lately, new plantations are made by sowing late autumn acorns, which are preferably obtained from oaks already known to be good cork producers. The acorns germinate very rapidly, the young trees require no further care, and on good soil, the first crop of male cork can be stripped off at the end of ten years. Planting is rare and only occurs for small stands, or in order to fill up gaps. The cork oak forests are almost exclusively the property of private individuals, who either strip off the cork themselves, or lease the forest for 20 to 40 years.

By the terms of the contract, the owner is often obliged to strip off the male cork and to superintend the clearing of the crown, etc. The tenant always undertakes to leave untouched the cambium layer ("mae"). The male cork is usually removed when the trees are from 15 to 20 years old. The operation generally takes place between June 1 and August 30, but is sometimes, though not frequently, effected in the second half of May. An interval of 9 or 10 years, often of from 8 to 12 years, intervenes between each stripping; this time is necessary to obtain cork 32 mm. (1 $^1/_4$ in) thick. In order not to weaken the tree unduly, and also because branch cork grows more slowly than stem cork, the stripping is confined to one portion of the oak at a time.

Cork Production. — An axe with a wide sickle-shaped blade is used for removing the cork. The sale unit is the "arroba" (32.38 lbs.). Cork is seldom exported in a raw condition, but is usually cut into strips according to classification; these are steamed and flattened after the defective portions have been removed. The pieces ("pranchas") thus prepared are compressed into bales of 59 × 27.5 × 23.6 inches and bound with iron bands. When bottle corks are made, the sheets are once more steamed and then cut into cubes (quadros); these are trimmed to shape, either by hand with a knife, or by means of a machine. Champagne corks are not manufactured in Portugal.

The wine corks of commerce owe their appearance to being placed in a solution of oxalic acid. When needed for other purposes, they are subjected to other operations. There are no linoleum factories in Portugal, where the cork refuse can be turned to account. The latter is, however, ground and used for floor cement; or is made into insulators.

Amongst the defects that occur in cork, "jaspeada" must be mentioned; this is a dark cloudy discoloration giving a marbled appearance to the cork. Green patches also are to be found, caused by a mould, which grows on the unripe cork; other defects are due to the injuries caused by various insects; those due to the attacks of the *Buprestidae, Coroebus undatus, Coroebus bifasciatus,* and *Agrilus,* and which consist of tunnels bored in the cambium layer, are called "colebra." Ants of the genus *Cremastogaster* cause similar damage, while *Tortrix viridana* ("burgo") attacks the leaves and acorns. The best quality of Portuguese cork comes from the districts of Beja, Evora, Portalegre and Algarve.

Cork plantations occupy the following areas:

District of Faro	46 930	acres
" " Beja	145 730	"
" " Evora	187 720	"
" " Portalegre	88 920	"
Remainder of the country	40 400	"
Total . . .	518 700	acres

The annual yield of good dry cork amounts to about 50 000 tons; the total production of cork is 58 192 tons (according to the latest statistics); of this about 11 tons are used in Portugal, while the rest is exported mainly to Germany, Belgium, the United States, Brazil and especially to England. The last country buys the most prepared corks.

The writer gives several tables of the analyses of Portuguese cork, as well as of the acorns of different species of *Quercus* together with their relative nutritive value.

LIVE STOCK AND BREEDING.

42 – Investigations on North American Ticks and their Control.

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The first studies made of the life history and habits of the North American Cattle Tick (*Margaropus annulatus* Say) were those of Dr. Cooper Curtice (1891, 1892). In 1898 Dixon and Spreull reported studies made on *Margaropus decoloratus*, and the same year Prof. C. P. Lounsbury in British South Africa began his classic studies of the Ixodoidea; other investigators soon followed with work on several species of ticks and among others Dalrymple, Morgan and Dodson published an account of experiments relating to the North American cattle tick and C. J. Pound published notes on the Australian cattle tick (*Margaropus annulatus australis* Fuller). Also in Germany, in India, Argentina, Brazil and Jamaica many observations on different species have been made by numerous investigators.

The Bureau of Entomology (U. S. Department of Agriculture) has conducted a course of investigation on all the cattle ticks hitherto found in the United States, and in its Bulletin No. 106 an exhaustive account (including description, host relationship, geographical distribution, life history, economic importance, etc.) of these species of ticks is given. The methods employed in the studies are also given, as well as a series of plates.

From an economic point of view, cattle ticks occupy the most important position among the ticks of North America owing to the part they play in the transmission of *Piroplasma bigeminum*, the cause of Texas fever in cattle. It has been estimated by Dr. Mohler (1905) that the cattle tick alone is the source of approximately $ 40 000 000 (about £ 8 000 000) annual loss in the United States. Mayer (1906) has estimated the annual loss as nearly $ 100 000 000 (about £ 20 000 000).

Besides the cattle tick, *Dermacentor venustus* Banks which transmits to man the causative organism of Rocky Mountain spotted fever, and perhaps *Argas miniatus* which transmits a spirochaete to poultry, are also to be considered. A good many other North American ticks are, hitherto at least, known only as ecto-parasites of man and of domestic and wild animals.

Margaropus annulatus lives usually on cattle, but the tick is often found on horses and mules, and on deer, buffaloes and sheep. But these latter animals, with the exception perhaps of buffaloes and deer, do not suffer from Texas fever.

Cattle ticks live only a part of their lives on their hosts, the rest being spent on the pastures.

The tick larvae attach themselves firmly to the skin of their host, where the female larva remains from 21 to 66 days, during which time it moults twice (like the male) and becomes a sexually mature eight-legged tick. It then mates with a male living on the same host and gorges with blood, attaining a length of about half an inch, after which it drops to the ground and lays its eggs on the pasture.

Egg-laying begins during the spring, summer and autumn months in 2 to 20 days, and during the winter months in from 13 to 98 days, after falling to the ground.

Egg-laying is retarded by low temperatures. It is completed in from 4 days in the summer to 151 days beginning in the autumn. During this time the tick may deposit from a few hundred to more than 5000 eggs. After egg-laying the mother tick dies in the course of a few days.

After a time, ranging from 19 to 188 days, the eggs begin to hatch. From each egg issue small six-legged larvae or seed-ticks which after a few days ascend the nearest vegetation, such as grass, herbs, etc., whence they try to reach a host by means of their long front legs.

The seed tick during its life on the pasture takes no food, and unless it reaches a host it dies of starvation. Its endurance, however, is very great, as it has been found to live without food nearly eight months during the colder part of the year .

The United States Congress in 1906 empowered the United States Secretary of Agriculture to inaugurate a plan of cooperation with the authorities of Southern States for the eradication of the cattle tick. The Federal appropriation for the fiscal year 1907 was $ 82 500 (about £ 16 500) and for 1908 $ 150 000 (about £ 30 000). Annually since then $ 250 000 (about £ 50 000) have been appropriated for this object. At first only 7 States cooperated with the Federal Government in the work of tick eradication. Now all the States interested in the question (with only one exception) have undertaken cooperation with the U. S. Bureau of Animal Industry.

In the eradication of ticks, either the pasture rotation method is used or the ticks are killed by insecticides applied by swabbing, spraying or dipping the cattle.

In the pasture rotation system the cattle are kept between March and September for 20 days in a pasture in which there are no ticks, then for 20 days in another such pasture and lastly for again 20 days in a third enclosure ; all these pastures must be free from ticks, so as to avoid the cattle becoming again infested with the parasites. The ticks (females) previously attached to the animals have in the meantime droppet off from their hosts and these are freed from them so long as they keep in tick-free enclosures. The three pastures grazed first must not be restocked with cattle until all the larvae hatched out from the eggs have died of starvation.

The carrying out of this rotation system, however, presents some difficulties, consequently the tick destroying agents, such as oils and arsenic, are becoming increasingly popular. Arsenical dips are very effective and during the past few years have come into much favour.

Progress of tick eradication.

STATE	Counties infected Aug. 1, 1906	Counties infected April 1, 1911		Counties released up to Apr. 1, 1911		Counties in which eradication is in progress	Square miles released up to Apr. 1, 1911	Square miles infected Apr. 1, 1911
		Whole	Parts	Whole	Parts			
Alabama	67	67	0	0	0	7	0	51 540
Arkansas	75	65	0	10	0	9	7 220	45 825
California	15	3	1	11	1	3	67 977	11 947
Florida	47	47	0	0	0	0	0	54 240
Georgia	144	141	0	3	0	6	815	57 328
Kentucky	2	0	0	2	2	0	841	0
Louisiana	60	60	0	0	0	2	0	45 420
Mississippi	78	73	2	3	2	17	2 032	44 308
Missouri	4	4	0	0	0	4	0	1 595
North Carolina	72	42	0	30	0	8	13 993	23 372
Oklahoma	59	52	0	7	0	6	7 890	40 000
South Carolina	42	38	0	4	0	8	2 673	27 497
Tennessee	42	8	4	26	8	6	11 989	17 210
Texas	190	178	5	7	5	11	13 311	178 574
Virginia	32	6	2	24	2	3	11 080	2 838
Total . . .	929	784	14	127	20	90	139 821	601 694

A formula commonly used is the following:

Sodium carbonate	24 to 25 lb.
Arsenic trioxid (white arsenic) .	8 to 10 lb.
Pine tar	1 gallon
Water sufficient to make . . .	500 gallons

The cattle and horses are to be bathed in this dip at intervals of not more than 20 days until no more ticks are to be found on the animals.

For dipping purposes vats made of concrete are useful, and they may, in many cases, be built by the cooperation of all the farmers of a community.

Up to April 15, 1912, 162 648 square miles have been freed from ticks, and this area is separated from the tick infested country by a strict quarantine. (1)

The accompanying table shows the progress of tick eradication.

43 - **The Tick Problem in South Africa** (2).

MOORE, WILLIAM (School of Agriculture Potchefstroom) in: *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 377-384. Concord, N. H., Oct. 1912.

The following is a list of ticks and diseases transmitted by ticks in South Africa.

Scientific names	Vernacular names	Diseases carried	Hosts
Boophilus decoloratus Kock	Blue tick	Texas cattle fever; redwater; *Spirochaetosis*	Cattle, horses, sheep
Amblyomma hebraeum Kock.	Bont tick	Heartwater.	Sheep, goats, cattle
Haemapysalis leachi Audouin	Dog tick	Malignant jaundice.	Dogs
Rhipicephalus appendiculatus Neumann.	Brown tick	East coast fever; gall-sickness of cattle; Texas fever.	Cattle
R. simus Kock . . .	Black-pitted tick	East-coast fever; gall-sickness; *Spirochaetosis*.	Cattle
R. evertsi Neumann .	Red tick	East-coast fever; gall-sickness; biliary fever of horses.	Cattle, horses

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(1) See No. 934, *B*. June 1912. *(Ed.)*.

(2) See: No. 2198, *B*. July 1911; No. 2425, *B*. Aug.-Sept.-Oct. 1911; No. 146, *B*. Jan. 1912; Nos. 358 and 359, *B*. Feb. 1912; No. 810, *B*. May 1912; No. 934, *B*. June 1912. *(Ed.)*.

Besides the ticks which are known to transmit diseases, there are many others which attack domesticated animals. Among these *Ixodes pilosus* Kock attacks sheep, goats, oxen, horses, etc., and is supposed to be the cause of a paralysis of sheep in Cape Colony, and *Hyalomma aegyptium* Linn., the Bont leg tick, may be found in the adult state on all domestic animals, and is thought by some to cause abcesses on the animals. Other ticks whose injury may only amount to tick worry, are *Ixodes rubicundus* Neumann, *Rhipicephalus oculatus* Neumann, *R. sanguineus* (Lat.). *R. lunulatus* Neumann, *R. duttoni* Neumann, *R. bursa* Canestrini & Fanzago, *R. nitens* Neumann, *Amblyomma variegatum* (Fabr.) and sometimes *A. marmoreum* Kock.

The life-cycle of many of the common ticks has been worked out by Dr. Theiler, C. P. Lounsbury and C. W. Howard. The eggs of *B. decoloratus* are laid in about five days or more from the time the engorged female drops from the hosts and hatch in from three to six weeks, — in winter a longer period is required. The larvæ may live for six or eight months without feeding. The moult from larva to nymph and from nymph to adult is performed, without leaving the host animal, in about three to four weeks. The eggs of *R. evertsi* hatch in about 30 days, and the larvæ can exist for seven months without feeding. The moult from larva to nymph is performed upon the animal in about ten to fifteen days. The engorged nymph drops from the animal and moults on the ground, seeking a second host for its adult existence. The adult tick may live for as much as a year, should it not find a suitable host; it remains on the host animal from six to ten days.

The life cycle of *R. appendiculatus* is typical for *R. capensis*, *R. nitens* and *R. simus* and is given for the group. The eggs are laid by the engorged female in about six or more days from the time she drops from the host animal. These hatch in from 28 days to several months, depending upon the temperature. The larva remains on the animal for about three to eight days, after which it too drops to the ground to moult — which is accomplished in about 21 days. The nymph attaches itself to a second host animal and remains for from two to seven days, when it drops off to moult to the adult. The second moult occupies about 18 days. The adult remains on the third host for a period of four to seven days. The larval tick can exist for seven months should it not find a host, the nymph six and one-half months, and the adult nine and one-half months.

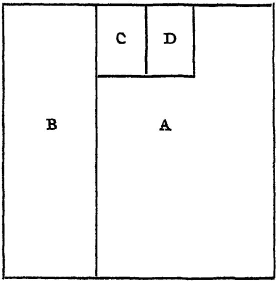
A. hebræum also has a life cycle much similar to *R. appendiculatus*. Three hosts are sought, the larva remains on the animal from 4 to 20 days, the nymph 4 to 20 days, and the adult 10 to 20 days. *H. aegyptium* differs from the above species in that the larvæ attach themselves to various birds and to hares. The larva moults to the nymph while on the bird, but the engorged nymph drops to the groud to moult to the adult. The adult attacks domesticated animals, being often very abundant upon oxen. *A. marmoreum* differs from *H. aegyptium* in that it is the larva or nymph which attacks oxen and goats, while the adult and also the nymph are very common upon tortoises.

"Trekking" and grass burning are old methods, but even yet often employed, for ridding flocks or herds of disease.

One of the farmers' favourite summer grazing sections of South Africa, is the High Veld. Over this area — lying between 4 000 to 6 000 feet of altitude — the ticks which transmit diseases are limited or nearly limited to *B. decolaratus* and *R. evertsi*, due to the fact that the other ticks cannot withstand the winter temperature. In the winter the stock farmers travel with their animals to the warm low veld, where the grass is abundant. If their animals become sick from some of the "tick diseases," they trek back to the higher country, where the disease would disappear.

By burning off the dry grass, the new green grass comes up much sooner and will furnish grazing for cattle and sheep at a much earlier date. Some farmers noticed that after the grass had thus been burned off, the animals suffered far less from ticks; the practice then came to be adoptad against the ticks themselves.

The starvation method of eradicating ticks — which has been so successful in the Southern United States, against *B. annulatus* — has been tried in South Africa, but has not been so effective. Generally here the question is not only the eradication of the blue tick, but also of the brown and red ticks and the Bont tick. In theory even these could be destroyed by placing all the animals in *B* (see the annexed diagram) and keeping them there for a period of 15 months; then transferring the animals to *C* and keeping them there for 18 days; then moving the cattle to *D* (so that the ticks which have dropped off in *C* will not have the time to moult and again seek the host) and keeping them there for another 18 days; and finally turning the animals — which are tick free — into *A*. *B*, *C* and *D* could be closed against cattle for 14 to 16 months and the farm thus freed of ticks. This method in theory would rid the farm of all the ticks which are known to transmit diseases to oxen, horses, sheep and goats. In practice, however,



Plan showing division of land for the starvation of ticks.

the starvation of ticks is not so easy, owing to the number of wild animals which will act as hosts to the ticks, thus carrying them over the starvation period. Of those ticks which transmit disease, but two species — *B. decoloratus* and *R. capensis* — do not find a host on the wild animals. The wild hosts of the other common African ticks are the following:

Amblyomma hebraeum: lion; wild dog; various antelopes; buffalo; giraffe; ostrich.
Rhipicephalus appendiculatus: lion; various antelopes; buffalo; Cape hare.
Rhipicephalus evertsi: reed buck; various antelopes; giraffe; Cape hare.
Rhipicephalus simus: lion; wild dog; jackal; bush pig; hedgehog.

In an actual trial of the starvation method carried out by H. E. Laws in the East London district, it was seen that the blue tick can be starved, but also that *R. capensis* seems to have some host among wild animals which has not been observed. Hares and duiker (one of the antelopes) which had been running on the experimental area were tick-infested when shot.

The usual and the most successful method employed in South Africa against ticks is dipping. The dipping fluid found most useful is that recommended by Pitchford, which is

5½ lbs. of soft soap,
2 gals. kerosene;
8½ lbs. arsenite of soda;
400 gals. water.

Even dipping has its disadvantages, if the farmer has many species of ticks to destroy. If only *B. decoloratus* is to be destroyed, dipping every three weeks will suffice; if *R evertsi* is to be destroyed the dipping would have to be done every week; if also the brown ticks (*Rhipicephalus* sps.) are to be destroyed, dipping would have to be done every three days. In order to make dipping every three days possible, the above formula has been modified to: 3 lbs. soft soap; 1 gal. kerosene, 4 lbs. arsenite of soda (20 % arsenic); 400 gals. water. In farms of over one or two thousand acres, dipping every three days would seriously interfere with any other farming operations; it seems more practical to dip every week and continue the dipping over a number of years.

44 - Nodular, Intestinal and Ganglionic Helminthiasis.

GRIMALDI, ERCOLE: L'Helminthiase nodulaire, intestinale, et ganglionaire. — *Hygiène de la Viande et du Lait*, Year 6, No. 11, pp. 590-610. Paris, Nov. 10, 1912.

In this article, which contains the results of observations made in the Municipal Abattoirs of Genoa, the writer, after giving a review of the literature on the question, calls to mind the fact that nodular *helminthiasis* attacks a large number of domestic animals and some wild species, being of general occurrence. It is found in cattle, sheep and pigs, and also infests deer. It occurs in Europe, Algeria, Tunis, America, Australia and Japan and, like all parasitic diseases, spreads especially quickly among wild animals. The nodular *helminthiasis* of cattle is due to an *osophagostomosis* and attacks by preference young animals.

The eggs, which are disseminated by infected cattle, when they fall in suitable places, hatch out and the larvæ become free. It is not known whether the latter have an independent life in the ground, or pass into an intermediate host. The eggs are laid at the beginning of autumn and the larvæ at the same season penetrate into the intestines of the animals. Water is probably the vehicle of infection in the case of cattle. This parasitic disease is never found in dry districts, but occurs in those which are irrigated and where the water has remained stagnant for some time. The larvæ, having found their way into the intestine, penetrate the mucous membrane by means of their rapid movements and reach the sub-mucosa, where they usually remain. Some of them, however, traverse the muscle layer and find their way beneath the serous layer, while others penetrate into the ganglia of the mesentery by way of the chyliferous ducts. Having penetrated into the thickness of the wall of the intestines, or below the serous layer, or even into the ganglia of the mesentery, the larvæ cause the formation of nodules, within which they remain for some months. But while those which are in the walls of the intestines emigrate towards the intestinal aperture from June to July, the others never succeed in overcoming the hindrances in their path and perish within the nodules. Having reached the intestine, the parasites differentiate sexually, and eggs are produced; these are expelled with the faeces and set at liberty larvæ ready to infect new hosts. The disease is characterised anatomically by the occurrence of nodules containing a nematode larva, in the course of the intestines and in the ganglia of the mesentery. The lesions of the ganglia have an undoubted similarity to those of tuberculosis and a confusion between the two might lead to very serious consequences. *Bilharzia crassa* also produces a helminthic form of nodule, which differs in its smaller size and its less resistant capsule. Tubercle nodules differ from the parasitic ones chiefly in that the former contain more caseous than purulent matter, and are clearly isolated from the surrounding tissues, besides being often surrounded by small tu bercles.

The most characteristic symptom of nodular *helminthiasis* is severe diarrhoea, the fæces being greenish and watery; this attacks several animals at once and assumes an enzootic character. The disease lasts about two months, and then gradually disappears; its evolution is slow and progressive. The sick individuals are low-spirited and emaciated; they suffer from pica and sometimes die exhausted by diarrhoea during the cachexic period.

From researches carried out by the writer on a large number of cattle, it seems logical to conclude that:

1. Bovine nodular *helminthiasis* is due to an *Osophagostoma* larva.

2. The larvæ leave the nodules to penetrate into the intestine in the months of June and July.

3. Contrary to what is maintained by some writers, the mesenteric ganglia can fairly frequently take part in the infection process and also simulate very closely one form of tuberculosis.

45 - Wireworms in Sheep and their Treatment.

THEILER, ARNOLD in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 4, pp. 572-586. Pretoria, October, 1912.

The writer first describes the development of the wireworm (*Strongylus contortus*) which lives in the fourth stomach of the sheep (1) and sucks nutriment from the mucous membrane (2). The female worm lays eggs which leave the sheep's body with the droppings. The eggs hatch out at a temperature of 40° to 50° F.; the young worm feeds on the organic matter of the manure and reaches the so-called ensheathed form, which withstands the influence of cold or dryness. This ensheathed form grows into the adult stage in the stomach of the grazing sheep, being taken up with the grass.

It is thus very necessary that the pastures should be kept free from infection. To this end, the sheep-breeder must always have at his disposal some pasture, on which no sheep or other ruminants have been grazing for at least nine months to one year. If, however, a flock is infected, which can be ascertained by examining the sheep manure, the worms must be got rid of by dosing the sheep, and the flock should be driven to a clean pasture. If the sheep again show signs of infection, for the parasites are not always all killed by dosing, this treatment should be repeated. By adopting this system of dosing and moving on to cleaned ground, it will in time be possible to eradicate the disease.

The grass of the infected pastures should be burnt each time on the removal of the sheep. Where, however, change of pasture and burning the grass are impossible, the repeated use of vermicides is the last resource.

The two best known medicines for dosing sheep are bluestone and "Cooper's Dip" and lately they have been used in combination. The result of a series of experiments as to the safe maximum dose of this mixture may be summarized as follows:

For sheep from 4 to 8 tooth: 15 grains of Cooper's Dip and 15 grains of bluestone.

For sheep of 2 tooth: 10 grains of Cooper's Dip and 10 grains of bluestone.

For lambs from five months old: 7½ grains of Cooper's Dip and 7½ grains of bluestone.

Experiments proved that smaller doses were effective and accordingly the doses recommended were as follows:

Sheep of 4-8 tooth: 10 grains of Cooper's Dip and 10 grains of bluestone.

Sheep of 2 tooth: 7 grains of Cooper's Dip and 7 grains of bluestone.

Lambs, six to nine months old: 5 grains of Cooper's Dip and 5 grains of bluestone.

It was found that one dose did not in every case destroy all the worms; therefore experiments were made as to how often, and with what intervals, these remedies could safely be used and it was found that sheep could be dosed ten times at weekly intervals with the maximum safe dose and thus freed from the parasites. This also applied to lambs.

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(1) It also occurs in the goat, deer and cow. (*Ed.*).

(2) See No. 1544, *B.* Nov. 1912. (*Ed.*).

Further experiments were made as to the effect of the above-mentioned remedies: 30 pregnant ewes were given, from some days up to some weeks before lambing, the whole or the half of the maximum dose; this was followed (in two instances where twins were born) by the death of the twins. This may be due to the actual dose, since in one other instance where the twins survived, the ewe had only been given half the safe dose.

The dosing of ewes with the maximal dose of Cooper's Dip and bluestone, given on the day of lambing or some days after, had no bad effect on the suckling lambs.

A second method of dosing sheep is by placing a lick of bluestone, Cooper's Dip, slaked lime, sulphur and salt in troughs to which the sheep could have free access. Although they each consumed on average 2.3 grains of Cooper's Dip and 2.3 grains of bluestone daily over a period of three months, these remedies had no effect in improving their condition. Thus direct dosing with the mixture is preferable to the use of the lick method.

Other remedies are " Kamala ", a medicine which is at present being tested, and " Bert Bowker's Powder ": this, according to the farmers, seems to have the desired effect.

46 - The Action of Anthelmintics on Parasites located outside of the Alimentary Canal.

RANSOM, BRAYTON HOWARD and HALL, MAURICE C.: *U. S. Department of Agriculture, Bureau of Animal Industry*, Bulletin No. 153, 23 pp. Washington, 1912.

This paper gives a systematic summary of all previous work concerning the use of anthelmintics against parasites located outside of the intestinal lumen, and also details the results of some attempted medicinal treatment of sheep for tapeworm disease (*Chysanosoma actinoides*). From the literature quoted, it appears that anthelmintics have been claimed to be efficacious in 8 cases of human somatic taeniasis (male fern); inefficacious in 8 cases of somatic taeniasis in the lower animals (male fern); inefficacious in at least 6 cases of intestinal and extraintestinal thysanosomiasis (carbon bisulphide and male fern); efficacious in over 14 cases of hepatic distomatiasis (carbon bisulphide and male fern); efficacious in 8 cases of venal distomatiasis (salvarsan); inefficacious in 5 cases of venal distomatiasis (salvarsan); and efficacious or inefficacious, according to various authors, in an indefinite number of cases of venal distomatiasis (male fern). Objections based on a critical examination of the cases are made by the writers to these figures; on the other hand their experimental results (with carbon bisulphide and male fern) were negative. However, the total evidence collected here indicates that further work along this line is necessary and desirable.

(A bibliography of 43 papers is appended).

FEEDS AND FEEDING

47 - New Feeds and their Value for Agriculture.

HONCAMP, F.: Neuere Futtermittel und deren Wert für die Landwirtschaft. — *Mitteilungen der Deutschen Landwirtschafts Gesellschaft*, Part 46, pp. 635-638. Berlin, Nov. 16, 1912.

The following is a report on the results of experiments carried out by the writer on the feeding and fattening of live stock at the Rostock Experiment Station, with the object of determining the value of foods recently put upon the market.

Dry Beer Yeast. Delbrück calculates that the German breweries turn out every year about 70 000 tons of fresh yeast which hitherto were more or less allowed to run to waste.

Air-dried yeast contains from 40 to 45 per cent. of raw protein; it is consequently a concentrated vegetable food rich in proteids which might find useful employment as complementary food in the fattening of pigs.

For drying beer yeast there are a number of apparatus of the usual type; vacuum drying has also been attempted, and this would have the advantage of requiring lower temperatures and consequently avoiding those alterations which diminish the digestibility of the albuminoids.

In the writer's experiments sheep utilized, in their maintenance rations, from 89 to 93 per cent of the proteids contained in the dry yeast; the same coefficient of digestibility may be admitted for pigs also. Fattening experiments carried out with sheep and with growing pigs have shown that for sheep, dried yeast as a complementary proteic food had the same value as a mixture (of equal starch and proteid value) of cottonseed meal and sesamum cake as well as oil-free soy cake. Similar results were obtained with pigs which were fed dry yeast in comparison with fish and meat meal. These experiments will be repeated. As for cows, the writer reports that they refused all food containing even small quantities of dried yeast. The price of this substance is not high: from 8 to 9 shillings per cwt.

New by-products of oil making are: *Guizotia oleifera* cake (Nigerkuchen) and *Perilla* cake; according to the writer the former contains in its dry matter about 36 per cent. of crude protein and 6 per cent. of fat; the latter 41 per cent. of protein and 8 per cent. of fat. The digestibility is respectively 87 and 91 per cent. for *Guizotia* cake and 87 and 88 per cent. for *Perilla* cake. These figures are approximately the same as those of other oil cakes. Hansen fed *Guizotia* cakes to sheep and found that their dietetic action was not good. Considering that both *Guizotia* and *Perilla* cake are made from small hard seeds relatively rich in silica and for which high pressures are necessary, the writer does not think it advisable that they should gain a footing in the market, unless they could be sold at a very low price.

The dry matter of rye germs contains 31 per cent. of protein and 9.7 per cent of fat; wheat germs 32 per cent. of protein and 7.8 per cent. of fat. Of the protein of the latter food 94 per cent. was digested by sheep and 90 per cent. by pigs; of the former food 92 and 91 per cent. respectively. Sheep digested 89 per cent. and pigs 86 per cent. of the crude fat of wheat germs, while the respective figures for rye germs were 90 and 72 per cent. They are thus feeds rich in albuminoids and especially easy of digestion, and much relished by all kinds of live stock. Wheat and rye germs are not usually found separately, but pass together with the bran into the siftings. When however they are isolated, they can be advantageously fed fresh, that is before being allowed to become rancid, to all kinds of live stock as complementary albuminoid food

Among the *foreign pulse* that has recently appeared on the market the following may be mentioned: the Calcutta-pea (Kalkutta erbse), the chickpea (*Cicer arietinum*) and the chickling vetch (*Lathyrus sativus*); the two latter were considered poisonous, but this view seems to have been contradicted by the present observations and experiments, at least for the chickpea, while the chickling vetch might under certain conditions be poisonous. It is perhaps something similar to what happened about 1870 with lupins, which on being fed produced widely spread disease, so-called "lupinosis", that for several decades past has not reappeared.

The writer has instituted experiments on the digestibility, on the part of animals, of these various kinds of pulse Digestive tests *in vitro*, have given the following percentages of digested protein:

Native beans	95 per cent.
Chickpeas.	93 "
Chickling vetch	90 "

The use of chickling vetches appears, at present at least, not to be advisable, and according to practical men chickpeas should not be fed to horses in which they seem to cause broken-windedness

The so-called molasses feeds in general consist of substances possessing very little or no nutritive value, mixed with molasses. In order to prevent the trade in these feeds, the special legal tariff No. 3 allows only those molasses feeds in which molasses is mixed with only one explicitly declared substance. Among the absorbents recently used, there is solubilized sawdust, that is sawdust treated with sulphuric acid under pressure in order to transform the lignin and cutin into dextrose (20 to 25 per cent), with the object of rendering it more palatable; it is fed warm and mixed with a certain quantity of warm molasses. It was stated to have a high nutritive value, but the analysis made by the writer on the dry matter yielded the following results:

	Crude Protein — per cent.	Nitrogen-free Extract — per cent.	Crude Fat — per cent.	Crude Fibre — per cent.	Ash — per cent.
Crude sawdust . . .	0.88	28.63	1.25	68.64	0.60
Solubilized sawdust .	0.77	40.30	1.00	57.33	0.70

thus showing that the treatment does not modify the composition of the sawdust to any great extent. Nevertheless a portion of the cellulose is transformed into sugars (diminution of crude fibre and increase of nitrogen-free extract). The writer therefore conducted some experiments with the view of ascertaining how these sugars were utilized by animals

The results of his experiments tallied with those of other previous investigators, and showed that crude sawdust, besides not being utilized, actually diminishes the digestibility of other feeds mixed with it. Solubilized sawdust does not come up to the level of the straw of winter cereals, and when mixed with molasses ("bastol") its digestibility is practically nil. The price demanded for solubilized sawdust is 8 shillings per cwt. a grossly exaggerated price.

It has been also suggested to mix sawdust with warm distillery by products, but even this method does not yield utilizable feeds. Some years ago pine needles from which the resinous and tannic substances had been extracted were suggested as an absorbent for molasses. But experiments carried out then by the writer with maintenance rations showed that between the degree of digestibility of natural and exhausted needles there was no sensible difference. Recent experiments conducted by W. Schneidewind on sheep with fattening rations fully confirm the above results.

Lupins, on account of their bitterness, are not palatable to live stock, with the exception of sheep. The usual methods adopted to eliminate this bitterness are not economic. Herr H. von Fehrenteil has constructed an apparatus in which the lupins are first steamed in a Henze vaporiser, mixed with potatoes, then crushed and dried between hot rollers. According to analyses made at the suggestion of the writer, the percentage of these "lupin flakes" was the following:

Crude Protein	Pure Protein	Nitrogen-free Extract	Crude Fat	Crude Fibre	Pure Ash
—	—	—	—	—	—
30.80	28.55	49.40	2.69	12.94	4.17

of which the following percentages are digestible:

Protein	Nitrogen-free Extract	Crude Fat	Crude Fibre
—	—	—	—
86	91	73	91

It is therefore a highly digestible product; but not even Fehrenteil's process has succeeded in eliminating all the bitterness, whilst the process of drying is perhaps still too expensive.

48 – Hydrocyanic Acid from Linseed Cake.

The Journal of the Board of Agriculture, Vol. XIX, No. 8, pp. 657-660. London, November, 1912.

1. *Feeding Experiments.* — Experiments have recently been conducted by the Board of Agriculture and Fisheries of Great Britain with a view to determining the effect, if any, produced on cattle by feeding with linseed cake yielding a high percentage of hydrocyanic acid on digestion with water. From a parcel of linseed, yielding 0.026 per cent. of hydrocyanic acid, cake cold-pressed at a temperature not exceeding 97° F., and cake hot-pressed

at a temperature of 160° F. were prepared. The cold-pressed cake yielded — on treating with water — 0.038 per cent. of hydrocyanic acid. This cake was fed to a heifer, 14 lb. being given each day for eight consecutive days, but no ill effects were produced on the animal. Another heifer was fed on the hot-pressed cake, yielding 0.032 per cent. of hydrocyanic acid. This heifer also received 14 lb. of cake per day for eight consecutive days and no ill effects resulted.

The above rations are very much larger than would ordinarily be given, and the linseed cake contained an exceptionally high percentage of hydrocyanic acid.

2. *Effect of Heat on the Ferment giving rise to Hydrocyanic Acid in Linseed.* — In the case mentioned above, nearly the same amount of hydrocyanic acid was obtained from the hot-pressed cake as from the cold-pressed cake on digestion with water. This result was contrary to the generally accepted view that the activity of the ferment in the linseed on the cyanogenetic glucoside, is destroyed by the heat applied in expressing the oil during the hot-press method of preparing linseed cake. It appeared desirable, therefore, that further samples should be examined in order to ascertain whether hydrocyanic acid corresponding in amount with that present in the original linseed is produced by digesting hot-pressed cake with water. The following results were obtained:

From parcel of Linseed	Seed or Cake	Percentage of Hydrocyanic Acid	Total Nitrogen per cent.	Ratio. Hydrocyanic Acid to Total Nitrogen	Seed from
No. 1	Seed . . .	0.013	3.50	0.0037	La Plata
	Cake . . .	0.026	5.00	0.0052	»
No. 2	Seed . . .	0.020	3.35	0.0060	Baltic
	Cake . . .	0.027	4.85	0.0056	»
No. 3	Seed . . .	0.018	3.21	0.0056	La Plata & Calcutta
	Cake . . .	0.030	4.69	0.0064	»
No. 4	Seed . . .	0.029	2.84	0.0102	Calcutta
	Cake . . .	0.049	4.22	0.0116	»
No. 5	Seed . . .	0.024	2.85	0.0084	»
	Cake . . .	0.044	4.30	0.0102	»
No. 6	Seed . . .	0.020	2.84	0.0070	»
	Cake . . .	0.047	4.33	0.0109	»

A direct comparison of the absolute percentage of hydrocyanic acid yielded by the seeds and by the cake (column 3 of the above table) is without value, as the result of removing oil from the seed is to increase the proportions of the remaining constituents in the cake. In order to ascertain whether any change has taken place in the activity of the enzyme in regard to the production of hydrocyanic acid, a comparison may be made between the ratios of the hydrocyanic acid to some other constituent, as, for example, the nitrogen. Column 5 shows that, except in one case, this ratio is slightly higher, indicating a greater production of hydrocyanic acid in the cake than in the original seed. The apparent increase may probably be due to the under estimation of the hydrocyanic acid in the seeds, owing to the difficulty with labcratory appliances in breaking down the body of the seed as thoroughly as it is done under the heavy rollers of an oil mill.

The results fully confirm those given above.

In a paper published in the *Journal of the South Eastern Agricultural College* (No. 20, 1911, p. 289) Dr. Auld states, with reference to the examination of a large number of oil cakes, that in no case was a diminished rate of formation of prussic acid noted in cakes of lower oil content which might be assumed to have been pressed at a higher temperature or kept under the influence of heat for a longer period. This statement tends to confirm the above results.

49 - Supply of Store Cattle and Slaughter of Young Cattle in Great

The Journal of the Board of Agriculture — Vol XIX, No 8, pp. 617-623 London, November 1912.

The problem of the rise in the price of store cattle and the extent to which young calves are slaughtered has already been dealt with in the *Journal* for August, 1911 and for April, 1912.

The statistics published by the Board of Agriculture show that in the period from 1906 to 1910 the average price of stores rose by about one-seventh. Exact figures showing the number of calves slaughtered each year are not available, but there is no doubt that, leaving out of account purely dairy breeds, such as Ayrshires and Jerseys, the proportion slaughtered to the number reared is very considerable.

It is sometimes suggested that the rise in the price of stores is due to an actual falling off in the supply; this, however, is clearly not the case, for, leaving out of consideration the abnormal year 1911, the number of store cattle imported from Ireland has on the whole steadily increased in the last few years, while the number of cattle in Great Britain, other than cows or heifers in calf or in milk, has remained almost stationary.

As is shown by the following figures, the rise in the price of store cattle during the last few years is almost exactly in proportion to the rise in the value of beef.

At first sight, it seems remarkable that the increase in price has not apparently resulted in any corresponding increase in the supply. The question, however, is not a simple one of supply and demand, but is complicated by the fact that in Great Britain the farms on which the cattle industry is carried on are, to a great extent, sharply divided into three classes: 1) dairy farms, on which a large number of calves are bred, but where few are reared; 2) rearing farms (having a quantity of cheap grass land, which

Year	Average for England. Fat Cattle (1st Quality Shorthorn Type) per 14 lb. stone			Average for G. Britain. Stores (1st Quality Shorthorn Type, Two-year-olds) per head.		
	£	s.	d.	£	s.	d.
1906	0	7	0	13	0	0
1907	0	7	10	14	1	0
1908	0	7	11	14	10	0
1909	0	8	2	14	7	0
1910	0	8	7	14	16	0
1911	0	8	2	14	4	0

is not good enough for fattening), on which calves — both home-bred and purchased, are reared, but not fattened; 3) fattening farms, where purchased store cattle are fattened.

While this general division is to a great extent necessitated by natural conditions, it is possible — in the writer's opinion — that the specialisation is in many cases unnecessary or carried too far.

In order to attain success in rearing, it is essential to obtain the right kind of calf; whereas at the present time, even in the dairying districts of Cheshire and the North of England, where a good class of Shorthorn cow predominates, many calves of a decidedly poor type are bred owing to the use of inferior bulls. Generally, such calves have to be sold in large numbers every spring for immediate slaughter. On the other hand, animals known to be well-bred are always easily sold, and as a rule the demand for such is much greater than the supply.

Another obstacle is the fact that the farms adapted for the rearing of calves are very often at considerable distances from the dairying districts.

The writer gives the following suggestions as a help to the solution of the complicated problem:

1. Dairy farmers keeping good general purpose cows, such as Shorthorns, Lincoln Reds, Red Polls and South Devons, could in most cases rely on a steady demand at satisfactory prices for their calves if they used better bulls than are employed in many cases at present. Even where heifer calves are to be kept, usually only a few from the best cows are reared; a bull of the beef type could be used for the others. Some system of co-operation could be devised whereby each man would have the use of two or more bulls. It would be advisable to select for the two purposes bulls of which the progeny would be easily distinguished, *e. g.*, in a Shorthorn herd an Aberdeen Angus bull, of which the calves would practically all be black and polled, might be selected to produce calves entirely for sale.

2. The cold and discomfort of a long journey, along with the sudden and often violent change of food, tends to induce scour (ordinary scour) and other troubles, and such calves often receive a serious check from which they recover very slowly, if at all. The difficulty would be greatly lessened, if the calves were kept for a couple of weeks before being sent away. Still more could be done by proper treatment of the calves when they reach their destination. One of the best methods adopted by successful rearers is to give a small dose of castor oil and some stimulant in a little warm milk, as soon as the calf arrives, and after an hour or so to give a small meal of milk. For the first few days the calf should receive very small quantities of food at a time, and should be fed at least four times a day. If the least sign of scour appears, a dose of castor oil should be administered at once, the quantity of food reduced by one-half, and a little chalk given. (It is a good plan to leave a lump of chalk in the calf house, so that the calves can lick it as they like).

The plan of selling young calves in markets and auctions must be strongly deprecated. Rearers might combine and after inspection of the cows and arranging terms and safeguards, agree to take the whole of the available calves from a dairy farmer or from a group of dairy farmers, in which case the rearers could have a voice in the selection of a bull.

" This is a problem well worthy of the attention of farmers' clubs and associations, and if any such feel disposed to go into the question, the Board would be pleased to advise as to what other societies it might be desirable to approach, and to do all they can to facilitate attempts to get into direct communication. "

50 - The Exportation of Zebus from Madagascar.

REUZE, ANDRE. L'exportation des Zebus de Madagascar. *L'Agriculture Nouvelle*, Year 22, No 1124, pp. 1051-1053. Paris, November 2, 1912.

Madagascar possesses large herds of native Zebus: the official statistics return those included in the census at 4 500 000 head.

The legs of these animals are very slender and their coat variable. They have very long lyrate horns, wide at the base and with slightly accentuated rings. Since the end of 1909, it has been attempted to export zebus for the French market, and in spite of the difficulties incurred at first, the scheme was continued, with the result that the last statistics give the number of these animals exported in 1911 at 16 253, worth about £45 200.

At the same time, the export was begun in the form of canned or cold stored meat. A factory was established at Boanamary, near Majunga, and has been working for nearly a year with every prospect of success. The Antogobato factory near Diego Suarez, which was opened first, slaughtered in one season alone, from April to October 1911, 10 000 oxen.

The exportation of this meat: 483 tons in 1910, and over 913 tons in 1911, at a value of about £63 560, together with the figures given for the exportation of live oxen, makes for the first year a trade amounting to some £110 000, April and May are the best months for dispatching live zebus, for at this date the animals have had time to recover from the winter, and the voyage through the Red Sea is less trying, while the cattle reach France when the cold is over.

The following figures are the results of data furnished by well-informed colonists and the Butchers' Syndicate. They show the probable profit to be derived from this trade.

A live zebu of 990 lbs., with a dead weight of 440 lbs., is worth, on the spot, £2 11s. 6d ; to this must be added:

Lading dues.		7	11
Wages of drover.		4	9
Cost of transport and food	4	19	2
Disembarking at Marseilles		4	9
Total . . .	5	16	7

The cost price at Marseilles will be £2 11s. 6d. plus £5 16s. 7d., = £8 8s. 1d. The hide pays for the slaughtering. At 5. 84d. per lb. of meat, this zebu will fetch 440×5. 84d. on £10 14s. 1 ½d., *i. e.* £2 6s. 0 ½d. net profit per head, from which must be deducted losses on route, thus leaving about £2. The present cargoes consist of 1200 head, so that the net profit of each voyage is about £2400 with a capital engaged of about £10 000.

POULTRY

51 – Researches on Diphtheria in Fowls and its Connection with Diphtheria in Pigeons and with Fowl-pox.

1. BORDET, J. La diphtérie des pigeons.

2. BETEGH, L. v. Ueber die Beziehungen zwischen Geflügeldiphterie und Geflügelpocken. — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, I Abteilung Originale. Vol. 67, Part 1-2, pp. 41-43 ; 43-50 + 2 pl. Jena, November 9, 1912.

1. — Dr. Bordet, Director of the Brussels Pasteur Institute, has already described, in collaboration with Fally, in 1907 (*Bulletin de la Société Royale des Sciences Médicales et naturelles de Bruxelles*, Juin 1907) and in 1910 (*Annales de l'Institut Pasteur*, Juillet 1910) the micro-organism causing diphtheria in fowls, which is distinguished for its extreme smallness, being perhaps the smallest that has ever been cultivated. He discovered that the inoculation of pure cultures in fowls, by means of scratchng the nictitating membrane, causes the typical disease, and that the micro-organism is found pure in the chronic lesion consequent upon this inoculation. The etiology of this disease being explained — according to the writer — it was desirable to ascertain whether diphtheria in pigeons was due to a similar organism.

Researches on pigeon diphtheria present special difficulties because the disease is rarely severe in adult birds, and it is generally limited to small whitish patches which appear most frequently in the cavity of the mouth, or sometimes in the folds of the conjunctiva, and it cannot always be communicated to other subjects by means of inoculation of the natural virus. This is therefore only very slightly virulent; consequently its cultures are still less so. In fact the writer did not succeed in causing the disease in pigeons by scratching the culture in. Nevertheless, considering that the micro-organism is found pure in great numbers in the lesions; that it is absolutely identical to that of fowl diphtheria; that on the other hand inoculations of pure cultures of the virus from fowls have caused the typical disease (in the writer's previous experiments) and that this virus has been found pure in the lesions thus caused; lastly that both fowl and pigeon diphtheria present symptoms closely resembling each other, the writer considers it evident that the virus recently obtained is the agent of diphtheria in pigeons.

The paper includes a description of the micro-organism in the lesions and on the artificial culture media and of the methods of culture.

2. — Fowl-pox has been believed by some to be connected with human smallpox, though it is not yet known if this belief is justified or not. The writer however has succeeded in causing the phenomena of pox in fowls by means of the virus of sheep-pox: a connection between the pox of fowls and that of mammalians may thus be supposed to exist. The writer summarises the opinions on this subject of several authorities and then describes his etiological investigations and physiological observations, according to which be confirms the fact that the virus of fowl-pox can give rise in fowls either to this disease or to diphtheria while the diphtheria virus can also produce fowl-pox. He concludes that:

1. The diseases known under the names of fowl diphtheria and of fowl-pox are etiologically identical.

2. The pathogenic agents are the corpuscles described by Borrel, *Strongyloplasma avium* Borrel, which may be included among the protozoa.

The paper is accompanied by an appendix of the bibliography consisting of 23 works.

52 - Egg-Laying Competitions at the Hawkesbury Agricultural College.

THOMPSON, D. S. in *Department of Agriculture New South Wales, Farmers' Bulletin*, No. 57, 15 pp. 1912.

These competitions took place for ten years and have brought to light many interesting facts. In the tenth series, the laying hens were supplied with animal food in conjunction with their ordinary rations; this diet was of some advantage in inducing egg-laying, but it is a question whether the increase in the number of eggs obtained covered the extra expenses involved.

In the autumn, the pullets which received no meat laid as well as those which were given this addition to their rations; but in the spring and summer, the meat-fed fowls proved the best layers. In appearance and bodily condition there was no appreciable difference between the two lots of pullets; but it is noteworthy, however, that while there were no broodies among the White Leghorns, which received no meat, there were five out of thirty in the corresponding meat-fed pens. Broodies were less prevalent than in previous competition, showing that greater egg-productive development lessens the tendency to broodiness.

The whole series has been carried out on essentially practical lines. The morning meal consisted of bran and pollard mash; twice a week, the mash was scalded with liver soup and the minced liver and soup mixed with the bran and pollard. This is not only valuable for its protein content, but a tonic and appetiser. In the afternoon, grain was fed, wheat predominating, but maize was fed more frequently in cold weather; it was also given once a week as a change. Green food was fed in the shape of rape and lucerne.

In the case of good layers of Leghorn breed, it may be advantageous to keep them into the third year, but any way they should be sold on the eve of moulting in their third season. The third year Leghorn hens showed a wonderful record namely a total of 1013 eggs and this breed proved itself to be the best for egg production. The average number of eggs laid annually by one hen rose from 130 at the commencement of the experiments to 184 at the close of the ten years. During the three laying periods of a three-year-old fowl, the number of eggs produced gradually decreases.

Meat feeding was tried in the case of the ducks and with good results.

The health of the birds was extremely good, showing a lower mortality than the average of the ten tests; the general average being 6 per cent. No cases of infectious or contagious disease occurred.

FISH

53 – Stocking Trout Streams.

HERRMANN, W. — Zur Besetzung der Forellenbäche. *Allgemeine Fischereizeitung*, Year XXXVII, No. 23. München, December 1, 1912.

Mistakes are very often made in the choice of material for stocking trout streams, other *Salmonidae* being frequently mixed with the trout. In order to pay well, trout-streams should be devoted to the breeding of this latter species alone, with the addition where possible of crayfish. The type of the individual stream should be taken into consideration in the selection of the trout to be introduced.

From this standpoint, the writer distinguishes three kinds of trout-streams:

1. The typical trout stream with crystal-clear water flowing rapidly over its pebbly bed and with scarcely any plants growing in it. Here the brown-trout (*Salmo fario* L.) thrives and it would be a great mistake to introduce *Salmo salvelinus* L. or *Trutta iridea*, which would soon lose their rapidity of growth.

2. Streams with gently flowing water, soft bottoms and with some reeds growing at their edges. As the food is here more varied, quick-growing brook-trout may be put in, such as the Moosach-trout, which as experiment has proved, will not thrive in the first type of stream.

3. The third group includes all streams with a moderate fall and thick growth of submerged water-plants. The excess of food present is due to the unusual number of small animal organisms, the very plentiful supply of insects which fall into the water, and to the small fish, which fall a prey to the larger trout. Such streams are full of

fish, but trout-breeding is much hindered by the presence of less valuable kinds, such as roach and perch. The further increase of such species must be prevented by systematic clearing. Often in these cases, recourse must be had to artificial stocking with trout, and a rapidly growing species such as the Moosach-trout is to be recommended. Further, grayling, barbel and perch deserve recognition as non-migratory fish, while *Trutta iridea* can be bred at the same time as these species, for there is a plentiful supply of food and this fish will contribute to the profits and lengthen the fishery season. The breeding of brook-trout will not suffer in any way, provided roach, perch and pike are exterminated.

FARM ENGINEERING.

54 - The Use and Cost of Electricity in Agriculture.

KEYSERLINGK (von). Ueber Verwendung und Kosten der Elektrizität in der Landwirtschaft.

(A Lecture given at the third general meeting of the Silesian Vereinigung für Wirtschaftslehre des Landbaues in Breslau, May 8. 1912). — *Archiv für exakte Wirtschaftsforschung*, Vol. 4. Part, 3, pp. 132-441. Jena, 1912.

AGRICULTURAL
MACHINERY
AND
IMPLEMENTS

The writer gives in the first place a clear explanation of the expressions and terms used in electro-technique, such as energy, power, metre-kilogramme, horse-power, ampére, volt and kilowatt-hour.

Then he enters into a description of some agricultural undertakings which are provided with electricity. The estate of Wilkau, which consists of 3642 acres of arable land and pasturage, and possesses livestock including 170 cows, 200 pigs, 40 horses and 60 draught oxen, has had since 1900 an electric plant with a dynamo with an output of 6.5 kilowatts and driven by about 11 HP.

The necessary force is supplied by a steam engine, which by means of a belt drives also directly a chaff-cutter, a mill and a grindstone. The secondary plant consists of 57 incandescent lamps, 2 arc-lamps, a 6 HP. motor for the dairy, a 1.2 HP motor for the water pump, and a portable motor of ½ HP.

An accumulator battery of 24 kilowatts supplies the current when the engine is not running.

The second estate with an electric plant is that of Piskorsine, which has a workable area of 2655 acres and live stock including 176 milch cows, 23 horses and 36 draught oxen.

The power is obtained from a suction gas motor, which works on a main shafting which by belting drives an oilcake crusher, an oat roller, a mill for crushing grain, a chaff cutter, the compressor for the "Mammut" pump, as well as a dynamo of 7.5 kilowatts. In the electric secondary plant, there are 140 incandescent lamps, 3 arc lamps, three 2 HP. motors and a portable motor of $^2/_3$ HP. The accumulator battery can produce 20 kilowatt hours.

The Guckelwitz estate has a workable area of 1942 acres, and 115 cows, 13 horses, and 48 draught oxen.

Here there is also an central electric station consisting of a dynamo of about 15 kilowatt performance, which is directly coupled with a Diesel motor of 20 HP maximum power. The secondary plant consists of 71 incandescent lamps, 5 motors, of 3, 12, 11, 4 and 3 HP, together with a portable ½ HP granary motor.

The three estates of Klettendorf, Bettlern, and Lohe are connected with the Klettendorf sugar factory central electric station.

The Klettendorf estate includes a workable area of 2949 acres and keeps 160 cows, 32 horses and 54 draught oxen.

It receives a continuous current with a tension of 110 volts. The secondary plant includes 85 incandescent lamps, a 22 HP motor as well as a 9.5 H.P. motor and a portable ¾ HP motor.

The Bettlern and Lohe estates, on account of their distance from the sugar factory, have a polyphase electric installation. The current is supplied to the estates with a tension of 5 000 volts and there transformed to the required tension of 210 volts.

The electric plant of Bettlern (which estate consists of 3076 acres of workable land and possesses 205 cows, 36 horses and 50 draught oxen) includes 153 incandescent lamps and 6 motors of 25, 7.5, 5, 1, ¾ and 10 HP.

On the estate of Lohe (workable area 2104 acres; live stock: 132 cows, 23 horses, 26 draught oxen) there are 118 incandescent lamps and 6 motors of 32, 10, 4, 2, 1, ¾ HP. After describing these 6 electric plants, the writer turns to the question of their cost.

The instalment cost at Wilhau was £563 10s., at Piskorsine £1401 8s., at Guckelwitz £2205; at the three estates of Klettendorf, Bettlern, and Lohe (which have no primary station of their own) the expense was £367 10s., £980 and £ 739 18s. respectively, without reckoning the outlay on alterations, or building. The cost of working the electric machines amounted on the three estates which have their own primary stations, and each requiring the service of a thoroughly trained mechanic, to £63 14s. and on the other estates to £24 10s. per annum per estate.

The expenses of grease, cleaning and repairs were £15 17s. to £39 4s. per estate per annum. The cost of fuel was:

At Wilkau, with own steam plant	£147
At Piskorsine with a gas engine	£48
At Guckelwitz with Diesel motor	£39. 1s.

Thus the direct annual working expenses are:

At Wilkau in round figures	£240
At Piskorsine „ „	£147
At Guckelwits „ „	£122

without interest or amortisation.

Through the electric-meter the following amount of current was registered as used per annum:

At Wilkau	about	5 000	K. W. hours
At Piskorsine	„	5 500	„ „
At Guckelwitz	„	16 000	„ „
At Lohe	„	16 000	„ „
At Klettendorf	„	24 000	„ „
At Bettlern	„	28 000	„ „

The reason of the great difference in the amount of electric force used is that at Wilkau and Piskorsine, the engines requiring most force are not driven directly by electricity while at Guckelwitz and on the other estates direct electric force is used for all the engines. Further, Klettendorf and Bettlern also drive the grain crusher, oat roller and oil-cake crusher belonging to two other neighbouring estates. For this reason the cost of the single kilowatt hour, also in Wilkau and Piskorsine, can only be accurately estimated if it is known what part of the expense was incurred by the engines which were directly driven without electricity. In Guckelwitz the average annual cost of the kilowatt hour, in the last two years, *exclusive of interest and amortisation* was, 1.2*d.*

This sum per kilowatt-hour represents the expense of a modern electric primary plant suitable for such an estate at the present time.

If it is considered that the cost of the interest on the capital and the amortisation of the plant, is not included and that it is not always well to sink much capital for many years in installing an electric plant, the above figure may probably be considered as affording data for estimating the price of a current supplied from a central station by overhead conductors.

The writer adds to these figures other observations.

If threshing could be performed by electricity at Guckelwitz, the cost of the kilowatt-hour would be lower, for the annual consumption of force would be considerably increased without raising the working expenses. On the other hand, the expenses of interest and amortisation would greatly rise, so that the whole cost of the plant would remain unchanged.

If, as in Guckeliwitz, the motor only drives the dynamo, and all the other machines are driven by separate electric motors, the advantage is gained that each machine can be set going at will and work separately without incurring the loss of force entailed through a principal belt-gearing.

The writer considers that the Diesel motor wears well as a driving motor, uses little fuel, is seldom out of order, and costs little for repairs; it is thus much more satisfactory than the suction gas motor or the steam engine.

Electric threshing makes great demands on the central electric station: the Diesel-motor and the dynamo have to be nearly twice their usual size, which results in a larger amount having to be set apart for interest and amortisation.

If it is required to drive a modern threshing machine with pneumatic straw stacker (a 63 inch fan drum; hourly performance about 40 cwts.) by electricity and make the straw into bales by means of a straw press at the same time or to chop it and to stack it with a pneumatic elevator on the spot, a motor of at least 30 HP must be selected. To drive a "Mammut" threshing machine of about 40 to 50 tons performance daily, a motor of at least 80 HP is required, if the straw is to be pressed or chopped at the some time. For the motor power must be equal to the greatest demands which may be made on it, in order that there may be no interruption of the work. Assistance may be afforded by providing the motor with a fly-wheel; this, like the weighty portions of the steam-engine when in motion, more or less counterbalances the unavoidable sudden variations in the power required during threshing operations.

The question whether threshing by electricity when attached by over-head conductors to a central station is preferable to threshing by steam, must be decided on the merits of each individual case. The answer depends upon different circumstances : *e. g.* the amount of space available for threshing, the expense of the electric conductors and whether the steam-threshing plant is new or not.

Portable motors are much to be recommended for driving winnowers, sorters, grindstones, machines for making straw ropes and any other machines which do not require much force. The use of apparatus for starting or stopping motors to drive water-pumps, by means of floats in the tanks which automatically throw them into or out of gear and thus make the pumps self-acting, is also very advantageous.

With regard to the systems of lighting, arc lamps entail a good deal of work, and as on a farm the suitable staff is usually lacking, incandescent lamps are better.

All lamps should be distributed as well as possible and the switches should be placed in easily accessible places.

The best switches are those with patent keys, as they can only be used by the person whose duty it is to turn the light off and on. In large stables multiple switches are to be recommended. In order to lengthen the working time in the winter and autumn months, the barns should also be lighted by electricity. A lamp of high candle power should also be affixed outside the threshing-floor, in order that the mechanics may have sufficient light to attend well to the engine.

All the advantages and conveniences, which electric lighting affords are, according to the writer, bought at a very high price. The expenses of lighting a unit of the workable land by means of petroleum and spirit amount on an average to 1.8*d* per annum and acre, in the case of twelve estates where electricity was not employed (workable area 24 172 acres).

The expense incurred on the six estates, where electricity was used in addition to other illuminants was 0.58*d*. per year and acre (workable area 16 360 acres).

On the six last estates, the cost of the electric lighting only amounted to $^2/_3$ of the total expense of illumination of 1.8*d.* per year and acre and thus should only have amounted to 1.22*d.*; in reality, however, the cost was about 2.45*d.* per year and acre.

Adding to this the 0.58*d.* expended on petroleum and spirit on the six estates where electric light was used in addition, the total lighting expense per year and acre (not including interest and amortisation) was about 3.03*d.*

It can therefore only be decided upon the merits of each separate case, whether the advantages offered by electric lighting justify the additional expenses incurred in its use, and further, whether electric light shall alone be employed or electricity also be used as the source of energy.

The electric motor possesses the great advantage of fulfilling all the requirements for driving machines and of doing this in a more satisfactory manner and with less expense for reconstruction or building than is entailed by the use of any other engine. Also it needs very little attendance.

The writer had only negative results in the electric plough experiments which he carried out in 1902, on account of the loss in the continuous current conductors and because the motors used were not sufficiently powerful.

Since that date, however, much progress has been made in electrical science, on the one hand from the use of high tension polyphase electric currents, and on the other hand from motors having been devised which correspond to the actual needs of ploughing operations.

RURAL ECONOMICS

55 - **The Capitalization Value of Real Estate.**

RURAL ECONOMICS

LAUR, ERNST.: Der Ertragswert der Liegenschaften. — *Fühlings Landwirtschaftliche Zeitung*, Year 61, Part 21, pp. 705-721. Stuttgart, November 1, 1912.

In No. 2 of the Archiv für exakte Wirtschaftsforschung, 1912, the writer has published a paper upon the estimation of the capitalization value of estates from the gross farming returns (1). He showed how the capitalization value can be better ascertained by a property valuation based upon the gross returns. The direct estimation of the gross returns, and the expenditure and the valuation of the estates by means of the net profits thus obtained was rejected as being too difficult.

A few weeks later appeared Prof. Aereboe's new work "Taxation von Landgütern und Grundstücken". The author also rejects the valuation based on net profits. While, however, Dr. Laur considers the capitalization value as an important factor, Aereboe repudiates it entirely. In this work, the writer thoroughly investigates the radical demand of Prof. Aereboe, which would entail a revision of the laws of valuation which are based upon the capitalization value and which he considers retrogressive.

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(1) See No. 1337, *B*, September 1912. (*Ed.*).

He thinks Dr Aereboe's definition that the capitalization value of an estate should be estimated from the net profits to be expected in the future to be too narrow a conception and distinguishes between past capitalization value, *i. e.* that which can be ascertained, and future capitalization value, which can only be estimated. The latter is the more important for purposes of valuation; the former however is indisputably of the nature of capitalization value. That the estimation of the capitalization value depends on the net profits of the past is no argument against this method. The estimation of the market value, which is recommended by Aereboe as the only correct one, must also be based on the past, and it is easier to arrive at probable future net profits from the consideration of dependable past capitalization values, than to estimate future market values from the sale prices of the past.

Aereboe's second argument against capitalization value is that the basis for this is not obtained by the estimation made by one valuer, but only by taking the valuation of the generality. This objection does not touch the essence of capitalization valuation, but only its possible misapplication, for the estimation is arrived at from the average capitalization value of similar estates. Aereboe finds an additional difficulty regarding capitalization value in the fact that opinions differ as to what should be considered as forming part of the net profit of an estate.

According to the writer, however, the difficulties in the estimation of the changes in the capital have little effect on the average capitalization values of several estates.

Aereboe believes that valuations made on the basis of market values would include fancy prices which exceed the agricultural value of the property and considers that, for this reason, the above method is preferable to estimation by capitalization value. This, however, the writer believes to be rather a disadvantage, for the relation between the average capitalization price and the mean market value gives a measure of how far the sum exceeds the local customary prices of land.

Aereboe also advances against capitalization value, that equal incomes under the different conditions of everyday life have very fluctuating purchasing power, or in other words, that the amount of pleasure and comfort which can be obtained for the same money is subject to great variations according to individual circumstances, and that an estate is, in the first place, a man's home and only secondly a source of profit. This objection in no way lessens the importance of capitalization value, which tells us what the estate is worth in capital, independently of the wants of the owner, whether these be few or many. If, in addition to the agricultural advantages, the possessor is willing to pay for the convenience of proximity to a town, he should know how far he is doing this, and for this reason it is again necessary to be acquainted with the capitalization value.

Aereboe then draws attention to the rate of interest, and says that equal returns with equal indebtedness of capital have to pay very different rates of interest annuities and that the income of the agriculturist consists entirely of the difference between his returns and the interest he has to pay on his debts. This faulty manner of estimating the value of property is, according to the writer, no reason why the science and teaching of valuation should give up a correct method. Interest on debts and annual payments cannot, of necessity, be included in the capitalization value, and this does away with the objection that the rate of interest in a country varies according to time and place.

Aereboe also considers that the conditions of taxation are a ground for rejecting capitalization value, for the value of the property depends on the rate of taxes.

Aereboe also alleges against the adoption of capitalization valuation that the latter does not cover the price of the estates. This is true, but when the capitalization value of a property is ascertained, it affords the buyer a means of calculating the risk he runs, in accepting the market price, of paying the property more than it is worth, and at the same time allows him to know how much more he pays it. On the contrary anyone who takes as basis only the average market price is no wiser than other would-be buyers and has not a really clear idea of what he is doing.

Aereboe looks upon the price of an estate as the result of a long building up of the market value and a criterion of the capitalization value of the property. According to the writer, however, he over-estimates the circumspection and foresight of the intending purchaser, for the present times clearly show the small part played by capitalization valuation and the large element of speculation in land purchase. The purchaser who does not take the capitalization value as a basis will always value the land too high, and if the land were to cost all farmers such high prices as correspond to the average sale prices of every decade, farming would almost cease to exist. The market values must be supplemented by estimates which consider the land exclusively from the standpoint of its returns. According to the writer, the capitalization valuation affords the best security against excessive prices being paid for estates; the recognition of the market value as a basis for judging the conditions of the returns of an estate and the rejection of capitalization valuations would be a step which might easily prove fatal to the agriculturist.

The intending purchaser learns from the statistics of the prices paid whether the sum demanded is above or below the usual average. The capitalization value affords him a means of calculating the money returns which he can expect.

As for the valuation of mortgages, Aereboe is of opinion that the value of the security is given by the price which can surely be obtained by the sale of the estate, within not too long a period, excluding from it the value of all those parts of the property that are liable to deterioration (devastierbar). The writer does not see why the capitalization value should not afford as good a basis of estimation as the market value. The Swiss Civil law has defined the following limits for mortgages for which the Cantons are responsible, since they provide the valuations: A mortgage can amount to two-thirds of the capitalization value of the land and to one-half of the value of the buildings. The security of these mortgages is so large that the Cantons have not hesitated to make themselves wholly responsible for the valuation, in order that it may be made with all possible care. The writer does not consider that Aereboe's method of valuing the security is in any way an improvement upon the Swiss enactment.

Aereboe rejects the estimation of the capitalization value even in the case of the succession duty and maintains that this should be based on the market value. He admits, however, that the market values of properties in a whole district usually exceed the capitalization value of these estates and sees the necessity of reducing them.

The writer readily agrees that the expropriation valuation must be based on the market value of the properties. Only in the rare cases where the capitalization value exceeds the market value can the owner be justified in demanding a sum of indemnity based on returns.

Neither the theory nor the practice of agriculture, nor legislation, can in any way be induced by the objections of Aereboe against the estimation by capitalization value to give up the important postulate that the land is a capital yielding profit and that its capitalization value plays the chief part in its valuation, mortgaging, sale, inheritance and taxation.

The objections which Aereboe makes against the form of the so-called Ertragstaxe (calculation of net income) are so far admitted by the writer, that he allows that the net income can only be ascertained by a system of book-keeping calculating separately gross returns and expenses but cannot be as certained from only one of these items. While Aereboe abandons the capitalization valuation also on practical grounds, the writer sees the possibility of giving the valuer accurately calculated average capitalization values by means of the formation of agricultural book-keeping offices. In the work mentioned at the beginning, the writer has shown how the material collected by the Swiss Peasants' Secretariat on the profitableness of farming can be made use of in estimating the capitalization values.

With the help of such returns, the Swiss Peasants' Secretariat hopes in the course of time to draw up the average capitalization values and their factors in the different districts and under the various conditions obtaining in the country. According to the writer, Aereboe's suggestion deserves the fullest support. The latter wishes for the establishment of special valuation bureaus to which should be entrusted the work of collecting the market prices; in the writer's opinion these valuation bureaus should also collect capitalization values. Work has been done already for some years in this direction in Switzerland and in the course of last summer, the Swiss Peasants' Secretariat was commissioned to forward suggestions respecting an intelligence bureau for the valuation of property. It was a question also of the establishment of a Swiss Peasant's Association, which should assist the peasant to extend the advantages of the new civil legislation also to the spheres of the laws of inheritance and of the mortgage of property.

56 - Farming Problems according to Working Expenses and Difference of Net Returns.

OSTERMAYER, ADOLF Landwirtschaftliche Betriebsfragen im Lichte von Produktionskosten und Reinertragsdifferenz — *Archiv für exakte Wirtschaftsforschung*, Vol IV, Part IV, pp 608-636 Jena, 1912

The author endeavours to show by means of some examples the value that the calculation of the cost of production has in judging some problems in farming. In valuing agricultural produce he applies the simplest principles of practical experience. Thus, for instance, the money value of farmyard manure is calculated according to a farm price which varies with the quality of the manure and the soil of the farm ; and for the sake of simplifying matters it is debited in equal proportion to all the crops of a rotation, while the labour of the hands and teams employed in the operation of manuring are debited to the crop which receives the manure.

Next follows the average cost of production of a series of crops, calculated on the account books kept during the year 1910 in nine peasants' farms in Moravia. In the cost of production the interest at 4 per cent. of all the capital invested in the farms is included as well as the wages for the manual labour of the owner, but no indemnity for the direction of the farm. The difference between the cost of production and the effectively obtained realisation prices does not represent the net returns, but the so-called difference of net returns (Reinertragsdifferenz), that is, the difference between the effective returns and the minimum interest required on the capital invested.

The writer shows that the cost of production varies inversely with the gross returns and that consequently it depends in the highest degree upon the many risks with which farming has to reckon. If the figures, which are obtained from farms which have remained exempt from all injurious influences be compared with the average costs of production the differences show clearly the characteristics of the year.

In the practice of illustrating the farm by means of book-keeping, the mean values drawn from the averages of several years are used, while the results of one year's accounts are useful in enabling comparisons to be made between them and their causes.

The data in figures given by the writer prove that the cost of production of winter cereals is throughout higher than that of spring wheat. Sugar-beets and mangolds show no important difference between them. The high cost of production of potatoes seldom allows of this crop being a paying one, whilst the cost of production of hay ensures the profitableness of this forage.

Rye and oats cost less in the mountains, while for wheat and barley the conditions of the plains are more favourable.

The depth of soil in the plain satisfies better the requirements of hoed crops, while the greater rainfall of the mountain climate is favourable to meadows. The calculation of the costs of production confirms thus the old experience that the farmer must adapt his work as much as possible to the natural conditions of production.

The employment of artificials reduces the cost of production of field crops and the systematic working of meadows reduces the cost of their produce by increasing the output.

The annuities for interest and amortisation of plain farms, on account of their greater value, are higher than those of mountain farms, which require greater quantities of seeds, of team work, of farmyard manure and of artificials.

The writer then proceeds to examine the question from the point of view of the profitableness of the farms.

The item of labour, on account of its importance, being one of those that weigh heaviest on a farm, has the greatest influence on its profits. With average daily wages at 1*s.* 4¼*d.* (exclusive of board), normal amortisation, and 4 per cent. interest on the whole capital, only sugar-beets in the plain farms and forage crops in both plain and mountain farms yield a profit higher than the interest. The profit on beets is the one that most feels the oscillations in the wages of labour; potatoes follow, then wheat and last of all forage crops. Only the latter afford sure profit even with considerably rising wages and in the mountains continue to do so longer than in the plains. The present costs of production indicate clearly to farms in the mountains the profitableness of forage crops and live stock raising, and that, with the increase of wages, the intensity of farming can only be maintained on the most naturally favourable soils and by replacing to the greatest extent manual labour by machines.

The oscillations in the prices of farm produce have also a very great influence on the net returns, consequently on the profitableness of farms; the sensibility of a farm to the rise and fall of the prices of produce can be judged by the range of its net income.

In a general average for all the farms examined, the greatest sensibility exists in connection with the prices of live stock, then follow the prices of cereals and thirdly the prices of milk. Among the prices of cereals, the variations in those of barley are most felt; they are followed by those of wheat and rye, and last of all by those of oats. Among live stock, the prices of oxen exert the greatest influence on the net profits of the Moravian peasants' farms; next come the prices of calves and of pigs. Here also a difference must be made between plain and mountain farms, inasmuch as the latter are more interested in the prices of live stock than of cereals, while the net returns of the former are more dependent upon the prices of cereals than of live stock. In general, the profits of plain farms are much more affected by all oscillations in the prices of produce than those of the mountain farms.

A comparison of the effects of variations in prices on the net returns of farms of different sizes shows that the prices of wheat affect large farms more than small farms, which feel more the changes in the prices of live stock. Both the large and the small farms have, however, per unit of surface, the same interest in suitable steady prices of wheat and of live stock and consequently in a customs and commercial policy which will ensure such prices.

Book-keeping thus points out to the farmer the lines on which to organize his work, and at the same time it renders incalculable services to agricultural policy and economics.

57 - The Work of the Office of Farm Management, of the United States Department of Agriculture.

SPILLMANN, W J.: *U. S. Department of Agriculture, Bureau of Plant Industry*, Bulletin No. 259, 84 pp Washington, October 1912.

In Part I of this Bulletin the attempt has been made to present an outline of the science of farm management, in so far as the knowledge of the principles of this science is available, and to point out the principal deficiencies in this knowledge. The object of Part II of the Bulletin is to present an outline of the organization and work of the Office of Farm Management, with sufficient discussion to make clear the methods of investigation followed and the purposes to be attained.

The work of the Office of Farm Management is divided into five sections as follows:

(I) *Office administration and records.*
(II) *Farm economics.*
(III) *Special farm-management studies.*
(IV) *Farm management field studies and demonstrations.*
(V) *Utilization of cacti and dry-land plants.*

(I) The first section is responsible for the care of the library and the office, such as correspondence and field reports of the staff; for the preparation and care of photographic records; for the revision of manuscripts; and for the financial records of the office.

(II) The subdivision of the work in the Section of Farm Economics is based partly on methods of investigation and partly on subject matter. The various types of investigation in progress are agricultural cost accounting, farmmanagement surveys, farm equipment, marketing farm products, agricultural credit, agricultural insurance and history of farm management.

Several methods, differing more or less, are used in cost accounting work in the Office of Farm Management.

One of these is as follows: Detailed records of all labor performed and of all transactions occurring on a considerable number of farms, are received in the office, and tabulated in such manner as to show the cost and income of each enterprise on the farm, as well as the general farm expenses which can not be charged to any particular enterprise. This renders it possible, at the end of the year, to determine the profit or loss from each enterprise, as well as of the farm as a whole.

In this work the office of farm management is co-operating with the Ohio Agricultural Experiment Station, the University of Wisconsin and the University of Missouri, the records from farms in these States being received and tabulated at the institutions mentioned, and copies of the tabulations being transmitted to Washington. The records from farms located in other States are received and tabulated in the Office of Farm Management.

Another method differs from the foregoing in the fact that the farms furnishing the records are located in a selected locality and are visited at frequent intervals by a representative of the office; these groups of farms are known as cost-accounting circuits. A representative of the office devotes his whole time to the 15 to 20 farms constituting one of these circuits.

In co-operation with the New York State College of Agriculture, at Cornell University, the office employs a man who devotes his time to helping a number of farmers, in the State of New York, to develop systems of bookkeeping including cost-accounting records.

The Office of Farm Management also furnishes to several hundred farmers, well destributed over the country, a special form of diary, and instructions and suggestions are made to the farmer, as to the records and tabulations it is worth while to keep. Experience with these diaries has shown that they give much valuable data concerning the cost and income from farm enterprises, and the dates when various farm operations occur. This latter information is of special value in studying the important question of the seasonal distribution of labor on the farm.

Besides the cost-accounting investigations just described, which refer to the whole farm, others are conducted on single enterprises with the aid of representatives visiting a large number of farms on which the enterprise under investigation is conducted.

The following is a partial list of the subjects on which the records obtained in the cost-accounting work furnish date of more or less value:

Kind, number and dates of operations required by every enterprise.

The character of crew (men, horses and machinery), and the amount of work per day and total time required for each operation.

The proportion of days in a given period that are available on the average for field work, or, the proportion of time lost from rain, holidays, necessary trips to town, unavoidable delays and the like.

Cost of production and income from the various farm crops and types of live stock under a wide range of conditions.

The general farm expenses, or the "overhead charges" on the productive enterprises of the farm.

The returns per hour of labor spent on different enterprises.

The amount of use, and hence the cost per acre and per unit of product, of each item of equipment, and its rate of depreciation, determined both from the successive annual inventories and from the length of time an implement lasts and the amount of work it does.

Length of the working day.

Time required for "chores" on farms of different sizes and types.

The relation of all phases of farm practice to crop yields.

The practicability of various crop rotations.

The conditions to which various farm enterprises are suited, and their relative profitableness.

Crops which compete and those which do not compete for labor at the same time of the year.

Relation of size and type of organization of farm to profit.

The cost of marketing farm products.

The rate of income on capital invested in farming.

The labor income of the farmer.

Distribution of capital between the various factors of production, such as land, buildings, fences, work stock, productive stock, implements and machinery, etc.

Cost of housing and feeding farm animals.

Cost of horse labor.

Cost of man labor.

Types of records adapted for use by the farmer.

These investigations cover practically the whole field of farm management, but many of the above data can be secured by cheaper methods.

Another important line of investigation conducted by the Section of Farm Economics is the farm management surveys. In this work localities are selected that are believed to be representative of important agricultural regions, and studies are made on every one of 500 or 600 contiguous farms, no farms being omitted from which it is possible to obtain the necessary data. These surveys are intended to reveal the actual status of the agriculture of the regions in which they are made.

Sufficient data are obtained from each farm to enable the investigator to determine the amount of capital invested, the value of all the major items of equipment, the amount and character of the farm expenses and receipts, the increase or decrease in the farm inventory for the past year, and all other facts necessary to determine the labor income of the farmer, after deducting interest on the investment, and wages for the unpaid labor done by members of the farmer's family other than the farmer himself.

The data obtained also permit the study of such questions as the relation of profits in farming to the education of the farmer, the relation of the age of the farmer to the percentage of tenant farming, the effect of distance from markets on the value of farm land, and numerous other questions of importance to agriculture in general.

The methods used in the investigation of equipment problems are closely similar to those used in the farm management surveys, though they are more detailed than the latter; the data are in the main obtained by personal visits to the farms studied, careful inventories of the various items of equipment being made. The study of actual practice, on a large number of successful farms, is thus the best means of arriving at the solution of many of the problems relating to farm equipment. The following is a brief outline of the more important subjects under investigation relating to farm equipment.

Distribution of capital between the various factors of production: The relative amount of capital invested in land, buildings, work animals and other stock, implements and machinery, supplies, and ready cash for current expenses on farms of different sizes and types in different climatic regions.

The farm dwelling: Its cost, peculiarities, interior arrangement, design, and construction.

Other farm buildings: Amount and character of inclosed space needed under given conditions; space units per animal; the arrangement of the inclosed space in relation to convenience and economy; the location of buildings with reference to each other and to the farm as a whole; the cost of buildings under all conditions; the cost of keeping buildings of different types in repair; and the rate of depreciation of buildings.

Farm fences: Conditions requiring or justifying fences; relation of the layout of the farm to economy in fencing; the cost of fences of different types; the amount of labor required in constructing fences; the cost of keeping them in repair; and their rate of depreciation.

Water supply and sewage disposal on the farm: Types of equipment and cost and practicability of the same.

Systems of heating and lighting farm buildings and the cost of installing and operating the same.

Equipment of farms of a particular type.

Relation of the size of the farm to the character, especially the size, of the equipment.

Equipment for particular enterprises.

General farm equipment and minor items of equipment.

Equipment for particular operations: this includes a study of the wide variation in farm practice in performing the same work and of the causes underlying this variation; the cost of a given operation when performed with different equipment.

Duty of machinery: namely the amount of work a machine or implement does, or should do, in a given time.

Standards of farm labor: A study of the amount of labor that may fairly be expected of a farm laborer under all conditions and in all kinds of farm work. Data of this kind are of enormous value in the management of hired labor, as well as in planning in advance a season's work, or in making out a working plan for a farm.

The proportion of time available at different seasons of the year for work of different kinds, especially for field work. The amount of labor and the number of work animals needed on a given farm at different seasons of the year.

Equipment charges: The rate of depreciation of farm equipment of all kinds; the cost of repairs; the cost of housing implements and machinery; the rate of interest on money invested in equipment of different kinds; and the amount of annual use of equipment and its bearing on the equipment cost of farm operations.

The conditions, especially the amount of use, that justify the purchase of a given item of equipment. Conditions which make hiring more desirable than the purchase of equipment.

Advantages and disadvantages of joint ownership of the more expensive machines and implements.

Use of mechanical power instead of horse power on the farm: Attention is given to types and sizes of tractors in use; conditions to which the various types are best adapted; conditions which justify the purchase of a tractor, also its original cost, the cost of repairs, and its rate of depreciation; the cost of operation and the crews and supplies required; the amount of work done per day and per season; and the cost per unit of work done.

Ancient and medieval literature regarding farm management, while by no means extensive, is yet sufficient to enable the careful student to gain a fair idea of economic conditions in agriculture at most stages in the history of European nations. A careful study of this old literature is being made in order to summarize for publication such of it as will interest farmers.

A study is made of the methods used in different parts of the country in preparing farm products for market, especially those that go to the ultimate consumer in the form in which they leave the farm, with special reference to the effect these methods have on the prices received; methods used in transporting farm products, especially perishable products, to distant markets, and the relation of these methods to market values; methods of organizing and conducting co-operative marketing associations; the effect these associations have on the net returns received by the farmer;

the distribution of enterprises with relation to the market centres; and finally the difference between prices received by the farmer and those paid by the consumer and the reasons for this difference.

An investigation is made of the sources of available credit for the farmer, the conditions under which he may obtain it for financing his operations, and the rates of interest on farm loans.

A study is also made of farmers' mutual insurance societies, their organization and conduct, and the rates of insurance paid.

The three subjects just enumerated belong to rural economics rather than to farm management, but are investigated in the Farm Management Office on account of their intimate relation to the subject of farm management, as well as for administrative reasons.

(III) This Section devoted to special farm management studies has given special attention to the problem of tenant farming, which is not only important at the present time, but is likely to become more so in the future. In fact it can hardly be doubted that tenant farming will further increase in the United States, and that ultimately the land will largely be owned by the wealthier classes, and be farmed by tenants with moderate capital.

Two phases of the subject are receiving special attention · one of these relates to the amount of working capital required to conduct a farm properly, especially with a view to maintaining the fertility of the soil, and the possibility of inducing the landlord to furnish this capital where the tenant is unable to do so The other relates to the details of the contract between landlord and tenant.

Another problem under investigation is the relation existing between the distribution of different types of farming enterprises and the geographical factors, so as to ascertain what are the real limiting factors in the distribution of the enterprises

The study of the problems of clearing and utilizing logged-off land, though not strictly a subject for farm management investigations, has been carried on by the Office of Farm Management, which is investigating the methods in use in the various sections of the country where these lands are being put into cultivation, as well as studying problems connected with the improvement of these methods.

The Office of Farm Management is also engaged in gathering up careful records of the effect of definite systems of farming on the fertility of the soil, especially those that give satisfactory crop yields. Studies are being made of all the leading farm crops of the country, to find out the economic conditions which render their cultivation desirable

Farm practice in weed control and in the matter of tillage is also investigated in this Office, and particular attention is also being given to the relation of weeds to the various crop rotations practised in different sections of the country.

The farm management features of haymaking, relating to the amount and kind of labor required, to the cost of production and the best manner of utilizing the crop as a source of revenue on the farm, are also studied.

Special attention is being paid to the cropping systems used on successful stock farms in all sections of the country and also to the maintenance of pastures and their place in the economy of the farm.

(IV) In the administration of the work of the Section of Farm-Management Field Studies and Demonstrations the country is grouped into three divisions as follows: The North Atlantic and North-Central States, the South Atlantic and South-Central States, and the Western States. In the cotton-producing States the demonstration work is conducted by the Farmer's Co-operative Demonstration Work. A division leader has charge of the work in each of the foregoing groups of States. Each of the geographic divisions mentioned is subdivided into groups of a few States each, and the division leader has an assistant or district leader in each of these groups. They devote their time mainly to the investigation of farm practice, but assist in the supervision of demonstration work. In the cotton States their whole time is devoted to investigations.

The objects to be accomplished by the work of the Section of Farm Management Field Studies and Demonstrations of the Office of Farm Management may be briefy stated as follows: 1) To carry to the farmer the results of scientific research on his behalf, as well as the results of the experience of other farmers, and to aid the farmer in applying these results to his work.

2) To reorganize and redirect the agriculture of the various sections of the country in such a way as to secure, on each farm, not only enterprises that are profitable in themselves, each being so conducted as to bring maximum net returns, but also to secure a system of enterprises that will permit the largest economical use of power, capital and labor possible under the conditions, and which will give, as nearly as possible, an even distribution of labor and a full utilization of equipment throughout the year.

(V) When the Office of Farm Management was organized and the work with grasses and forage plants transferred elsewhere, the work with the cacti and dry-land plants was retained, because of the personal interest of representatives of this office in certain important problems relating to these, and it has since been maintained in the Office of Farm Management. The first investigations of the cactus, as an economic plant, represented a study of farm and range practice in the use of these plants as forage for cattle. Much time has been spent in working out the cultural details of the cactus, when grown as a farm crop, and several feeding experiments have been conducted to determine its forage value.

The range investigations being carried on by this office are designed to secure accurate data upon the following subjects:

The possible recovery of run-down ranges of different types, under partial and complete rest, and the rates at which recovery occurs.

The possibility of improving the native ranges artificially.

The carrying capacity of the ranges, present, normal and possible.

An estimate of the area and geographic distribution of the open range, with a summary of published topographic and climatic data relating thereto.

The chemical composition of and the botanical and economic data concerning the different species of range forage plants.

Range management with different kinds of stock with and without fence.

Several years ago an area of over 50 square miles of badly overstocked and depleted open range land, in southern Arizona, was set aside as an experimental range, and placed under the control of this office. The land was fenced and the greater part of it has been allowed to recover naturally. The remainder was divided into several pastures and has been carrying stock, mostly cattle, all the time.

Thus far this experimental range has demonstrated that a range, in southern Arizona, will recover approximately its normal carrying capacity, in three to five years, if allowed complete rest.

The hay-cutting operations and the collecting and weighing of the spring feed are beginning to furnish accurate data on the actual amount of feed per acre produced annually on the protected range. These data and those obtained from the records of stock actually carried on adjoining measured areas will give something definite as to the normal carrying capacity of this region.

The work in range management relates to the various methods of management of stock, particularly cattle and sheep, upon the native ranges of the arid region. Data as to the cost of various operations, the construction and care of machinery and equipment, methods of handling stock, causes of loss of stock, and methods of disposing of the output are collected and summarized.

The data are obtained from experienced stockmen in different parts of the country working under different range, climatic, and commercial conditions.

58 - Changes in the Manner of Farming in the Rhine Country, and their Causes.

BRINKMANN, TH. Veränderungen in der Betriebsweise der rheinischen Landwirtschaft und ihre Ursachen.— *Fühlings Landwirtschaftliche Zeitung*, Year 61, Part 19, pp. 625-643. Stuttgart, October 1, 1912.

The changes which the present time has wrought in agriculture bear chiefly upon the methods of farming; nevertheless they are far-reaching in their effects.

As for the changes in the farming of the Rhine country, the writer states that, according to a recent publication of the German Council of Agriculture, the wages of farm labourers during the last thirty years have increased on average by 100 per cent., and in the western provinces the increase has been still higher. On the other hand statistics show that the prices of machines and implements have sunk, *not only in an absolute sense but also in* relation to the improvement of their performance and durability.

Artificial manures, namely those containing phosphoric acid or nitrogen, have become much cheaper since 1880, as can be seen from the following table:

Period	1 lb. Phosphoric acid in superphosphate	1 lb. Nitrogen in nitrate of soda	1 cwt. of kainit containing 12.4 % of pure potash
1880-89	3.23*d*	9.60*d*	10.75*d*
1909	1.87*d*	6.15*d*	8.96*d*

The oscillations in the prices of concentrated foods are less uniform, some being cheaper and others dearer.

The prices of the means of production form one factor in the conditions of production, and the prices of agricultural produce the other. In this connection the writer gives the decade averages of the prices of the most important agricultural staples in Prussia proper, reaching back for nearly a century. The earliest part of this period, which is characterised by a continuous rise in prices, is here omitted, and in the following table only the prices of the last decade are shown, considering the prices of the period 1871 to 1880 equal to 100.

	Wheat	Rye	Oats	Straw	Hay	Potatoes	Beef	Veal	Pork	Prussian Smoked Bacon	Prussian Lard.	Butter
1901-10 . .	86	95	104	105	97	100	132	166	123	92	96	110
1911 . . .	89	95	111	109	106	161	146	187	119	92	96	120

In the next table the prices for the Rhine province are given ; those from 1901 to 1905 = 100.

	Wheat	Rye	Oats	Barley	Straw	Hay	Potatoes	Beef	Pork	Veal	Mutton
1906-10	121	120	116	119	103	101	112	114	111	116	117

The writer then considers the consumption of artificials, which is yearly increasing, in connection with the intensity of farming.

The following table in which the yearly consumption of pure potash (K_2O) in lb. per acre of cultivated area is given, affords an idea of the increased consumption.

	1890	1900	1910
Rhineland	0.27	1.58	6.88
Prussia	0.84	3.70	11.02

A further change in farming is brought about by the extraordinary increase in the price of labour and the consequent necessity of using labour-saving machines. In an extensive table the writer shows what changes have taken place during the last thirty years in farming in the Rhineland. It appears thus that machines are not only used in the large farms but also in the smallest, for in 1907 an average of 35 per cent. of the farms measuring from 5 to 12½ acres in extent, and nearly 6 per cent. of the smallest farms used large machines.

Changes on a large scale in the utilisation of the soil can only be perceived by examining a considerable period of time. The writer therefore collects data, for the period between 1878 and 1900, on the crops raised, arranged according to their destination. They are divided into five groups, and the percentage of the whole cultivated area that each occupies is given. The most striking changes in the areas devoted to the various crops are the following: The groups of purely forage plants and of those with a twofold destination have both gained ground, while since 1893 the area devoted to wheat has considerably diminished in all the districts. Similarly spring wheat and barley have lost ground, barley losing almost a quarter of its original area. Oats have sustained their price best of all. Oat straw has gained in importance as fodder, which is explained by the greater use of concentrateds together with straw, and especially oat straw, in the feeding of stock.

Very interesting also are the results of a table, drawn up by the writer, which shows how the extent of live stock rearing has changed during the last thirty years in the various classes of farms, grouped according to acreage. They prove, in accordance with what may be daily observed, that the amount of cattle kept by the smallest farms has everywhere diminished. On the other hand, they show that the small peasant farmers present already the greatest increase in their stock of cattle and that with the increased acreage of the farm both the amount of cattle and its increase from 1883 to 1907 grow less and less. Similarly in pig keeping, only that here the difference consists in the fact that the smallest farms take the lead considerably ahead of all the others, especially in the thickly populated Düsseldorf district.

The last thirty years have witnessed an extraordinary increase in the quantity of live stock kept, but it must be recognized that this increase has gradually declined; in fact, in its most important branch, namely cattle, the maximum has been passed, for since 1907 a backward movement has set in, nearly the same in all districts.

Though it is a fact that the profit on live stock has somewhat diminished during the last few years, the writer believes that the future prices of animal produce will be favourable to the farmer.

The difference in the consumption of meat and milk, which according to statistics still exists between the several parts of the country, between town and country, between large and small towns, and between the several classes of the population according to their degree of prosperity, lead to the conviction that if there is a branch of farming which holds out prospects of greater profits, it is the keeping of live stock for the production of meat and of milk.

59 - The Remedies for Rural Depopulation in Great Britain.

STRUTT, HON. EDWARD GERALD, President of the Surveyors' Institute. Opening Address read at the ordinary General Meeting of the Surveyors' Institute, on November 11th, 1912. — *Transactions of the Surveyors Institute*, Session 1912-1913, Vol. XLV, Part I, pp. 1-42. London, November 11th, 1912.

One of the great questions now agitating the people of Great Britain is the decline of the agricultural population

The following figures showing the people engaged in agriculture in England and Wales between 1881 and 1901 will illustrate the importance of this subject.

Date	Farmers and Graziers	Agricultural Labourers including Shepherds and Carters	Totals
1851	249 431	1 376 051	1 625 482
1861	249 735	1 296 805	1 546 540
1871	249 907	1 073 084	1 322 991
1881	223 943	965 217	1 189 160
1891	223 610	866 034	1 089 644
1901	224 299	727 140	951 439

One of the most unsatisfactory features of the agricultural statistics is the continually increasing area of pasture land and the decrease in arable. The loss of 2 000 000 acres of arable land in Great Britain in the twenty years 1881-1901 probably threw out of work from 60 000 to 80 000 labourers at least during that period. The number of acres withdrawn from the plough since 1901 is about 942 000, making a decrease in arable land in thirty years of nearly 3 000 000 acres. It would therefore appear that one of the most effective ways of increasing the agricultural population would be to reconvert a considerable portion of these inferior pasture lands to their original use, which is that for which they are best fitted.

During the last eighteen years, on an estate in which the writer is interested in the east of England, careful field accounts have been kept of the expenses and receipts both on pasture and arable land, and certainly some striking results are shown which contradict the fashionable theory of writers on agriculture that corn growing is unprofitable, and that the farmer must now look entirely to his stock if he wishes to succeed in his venture.

These accounts represent two farms of roughly 2 000 acres, of which about three-fifths are arable land and two-fifths pasture.

Table I summarizes the net financial results per acre over 1) the whole eighteen years; 2) the first twelve years and 3) the last six years. The average profit per acre shown has been arrived at after charging all expenses, including rent, rates and taxes, but excluding interest on capital.

	Eighteen Years: Period 1894-1911				Twelve Years: Period 1894-1905				Six Years: Period 1906-1911			
	Total number Acres	Average Profit per Acre			Total number Acres	Average Profit per Acre			Total number Acres	Average Profit per Acre		
		£	s.	d.		£	s.	d.		£	s.	d.
Wheat	4 093	2	18	8	2 358 ½	2	5	2	1 734 ½	3	17	0
Barley	3 603 ½	2	3	4	2 480	2	1	4	1 123 ½	2	7	9
Winter Oats	1 980 ½	2	18	6	1 238 ½	2	17	6	742	3	0	1
Spring Oats	1 357 ½	2	1	7	740 ½	1	19	2	617	2	4	8
Beans	521	1	5	1	354	1	1	11	167	1	11	11
Peas	595 ½	0	19	11	389 ½	— 0	3	2	206	3	3	8
Swede and Mangold Seed	546	2	5	5	485 ½	2	8	9	60 ½	0	18	6
Red Clover	2 084 ½	2	11	6	1 288	2	9	9	796 ½	2	14	4
Sanfoin	785	1	9	6	695 ½	1	8	9	89 ½	1	14	8
Lucerne	726 ½	1	5	4	544 ½	1	6	7	182	1	1	3
Rye, Tares, Trifolium	526	0	6	3	337	0	7	9	189	0	3	7
Mangolds	2 656 ½	0	18	2	1 668 ½	0	10	0	988	1	12	5
Potatoes	515 ½	4	13	1	113 ½	— 0	12	4	402	6	2	9
Cabbage, Kohl Rabi, etc.	703	— 0	2	8	505 ½	— 0	4	0	197 ½	0	0	2
Maize	275	1	4	10	236 ½	1	4	0	38 ½	1	6	6
Permanent Grassland	13 514 ½	0	7	11	9 133 ½	0	8	7	4 381	0	6	6

Note: Losses are shown by — (minus).

The following figures show the results of stock-keeping on the same area of land:

	18 Years 1894-1911 Annual Profit	12 Years 1894-1905 Annual Profit	6 Years 1906-1911 Annual Profit
	£ s. d.	£ s. d.	£ s. d.
Cows	801 0 6	716 0 0	972 0 0
Cattle	— 32 0 0	— 75 0 0	54 0 0
Pigs	— 11 0 0	— 1 0 0	— 31 0 0
Sheep	— 14 0 0	— 32 0 0	22 0 0
Poultry	143 0 0	159 9 3	111 0 0
Total Profit	887 0 0	767 9 3	1128 0 0

Note: Losses are shown by — (minus).

It will be observed that the cows and poultry after being charged with every expense have been profitable to the farm.

The net annual profit from the arable land over the whole eighteen years has been £2 1*s* 7*d* per acre, and from the grass land during the same period 7*s*. 11*d*.

Dividing the period into two portions, taking the first twelve and the last six years — the second period representing somewhat the recent agricultural revival — the net profit during the first twelve years from the arable land was £1 14*s*. 3*d*. per acre and from the grass land 8*s*. 7*d*.

During the last six years, with the prices of all agricultural produce increased, results from the arable land were £2 14*s* 9*d* per acre and from grass land 6*s*. 6*d*.

It is specially interesting to note that the wheat crop grown in the dry climate of the east of England has proved the most profitable, and it would seem to be possible if the prices of the last six years should be maintained, that a far larger area of wheat might be grown than is now the case. A very interesting paper on this subject was recently read by Mr Christopher Turnor, who believes that Great Britain could produce at a profit one-half the wheat consumed instead of one-fifth as at present.

The above figures and those given on Table I show that corn crops generally have on the whole paid their way satisfactorily, and if the alternative cultivation could be made equally profitable, the arable farming would be a fairly successful venture.

As far as the problem of increasing the number of small holders is concerned, the writer is of the opinion that any attempt to augment the number of small-holding tenancies should be carried out under a definite and carefully thought-out scheme, the small holders being placed in positions where they could conduct successfully the special industries with which the small farmer has an advantage over his larger neighbour. The districts selected should be those with market facilities, where small holders already exist, or where the soil, climatic and transit conditions are favourable for the growth of special crops requiring the interested and careful attention of the cultivator. The growth of intensive crops would also assist in maintaining a larger agricultural population, and in this connection the following table, showing the acreage under small fruit, apart from orchards, in 1900 and 1911 is noticeable, the percentage of increase being large:

Year	England	Wales	Scotland	Total
1900	66 749	1109	5922	73 780
1911	76 287	902	7119	84 308

To turn to another intensive crop, the acreage of hops in England in 1911 was 33 056 acres, the total ten years previously being 51 127 acres and 56 145 in 1891. It will be observed that there was a large reduction during the ten years 1901 to 1911. The cost of cultivation is so large that hops can be grown only by capitalists who can stand the variations of good and bad seasons and who are prepared to take every advantage of the latest scientific knowledge. It is nevertheless an industry which directly employs a great deal of labour, costing, it is estimated, at least £18 per acre, and if it could profitably be extended where the land is suitable, it would provide a large amount of additional work for the agricultural population. Another crop requiring a large amount of labour, and about which a good deal has been said during the last few years, is sugar beet. The importance of the introduction of the growth of sugar beet in England cannot be overrated, for if a good alternative crop could be grown which would pay a fair profit, and at the same time clean the land, it would remove many of the agricultural difficulties now existing. All possible support and encouragement should be given to pioneers of this industry, realising that if they succeed in their undertaking they will have rendered a great service to British agriculture.

There are many other ways in which an enlightened Government might assist the prosperity of agriculture and so preserve a larger population on the land. The practical instruction in the case of the small holder seems to be of primary importance; proper and convenient means of cheap transit must also be provided by an extension of light railways and of systems of motor lorries in connection with the great railways or the centres of population.

An extension of forestry is also proposed by many as a means of increasing the country population, but it is difficult to see how planting on land of fair value could be made a commercial success, though possibly as a form of compulsory saving to individual landowners it might have advantages.

And lastly, though certainly not occupying that position in importance, there is the question of rural housing. In this respect it might become advisable to follow the example of Ireland under the Labourers Acts. There the district councils formulate schemes for the erection of horses and securing garden plots in accordance with the requirements of their districts, the Local Government Board being the department responsible for holding local inquiry into any schemes put forward and for sanctioning them if satisfied that they are reasonable.

If a scheme is sanctioned, the necessary capital is advanced by the Land Commission repayable in 68½ years by equal payments. The interest is 3.5. per cent — 2 3/4 per cent. representing interest and ½ per cent. sinking fund. The number of houses authorised to the 31st March 1912 was roughly 49 000, of which 40 000 have been built and occupied, and 9 000 are in process of erection. Parliament voted £5 250 000 altogether in connection with these Acts, and it has been earmarked for housing purposes.

Whatever may be done, either in the directions indicated by the writer or in others, it is essential, if the rural population is to be increased, that the cultivation of the soil should be a paying business. The English cultivator has to compete with all parts of the world, and no undue burden therefore should be placed on his industry.

A wise Government should give him every assistance possible, particular care being taken to encourage the expenditure of capital on the land, and so far as possible to assure to all those engaged in the industry a reasonable reward for their enterprise.

The writer closes his address with some considerations concerning the breaking up of large estates, which is the noticeable feature of the present day and expresses the opinion that the same has probably two main causes: the chief one, the Finance Act of 1910, and the increase of death duties, which press with peculiar severity on agricultural estates, together with the promise of further legislation which may be antagonistic to the landowning class.

AGRICULTURAL INDUSTRIES.

DAIRYING

60 - The Importance of Infectious Catarrh of the Vagina in the Control of Milk.

MESSNER, AND KOHN, F. G. Die Bedeutung des infektiösen Scheidenkatarrhs für die Milchkontrolle.—*Zeitschrift für Fleisch- und Milchhygiene*, Year XXIII, Part 5, pp. 99-104. Berlin, December 1, 1912.

Not only diseases affecting the lacteal glands themselves bring about great changes in the milk, but these alterations are also induced by the diseases usually accompanied by high fever which attack milch cows.

In epidemics of these diseases, milk control entails, not only taking measures to protect human beings and animals from infection, but ascertaining whether the normal physical and chemical composition of the milk has suffered in any way, for only by such means can it be determined whether perhaps some of these changes are due to want of cleanliness in the handling of the milk.

The writers have examined to this end the milk of cows suffering from infectious catarrh of the vagina. To ensure accuracy in the comparison, the milk of the healthy cows inhabiting the infected shed was also examined.

The tests were usually made midday and evening, and the following points were noted.

1. The breed or family of the milch cow.
2. The age of the animal.
3. Duration of lactation period.
4. Milk yield.
5. Condition of health.

The following data were obtained from the examination.

1. The specific gravity, by means of lacto-densimeters.
2. The fat content (using Gerber's sulphuric acid method).
3. The dry matter, reckoned according to Fleischmann's formula.
4. Solids not fat.
5. The refractive index of the milk serum (Ackermann's method).

The milk of 105 cows in 29 sheds was investigated, and 40 of these animals were healthy, 65 diseased; 56 were attacked by chronic catarrh of the vagina, but only 9 had the disease in the acute form.

The appearance of the milk is unchanged and it is only on examining the averages that the difference is clearly seen. The milk yield decreases, the fat content rises, the amount of solids not fat diminishes and the refraction index is lower; but all these changes are only distinctly noticeable when the milk of diseased and healthy cows is compared at the same stage of the lactation period.

For this purpose, the writers compared the averages obtained from the examination of the milk from 8 healthy cows and from 9 animals suffering from the acute form of the disease:

	Healthy	Diseased	Difference
Total milk yield	2.53	1.80	— 0.73
Specific gravity	1.0330	1.0312	— 0.0018
Fat content . .	3.5	4.3	+ 0.8
Solids not fat .	9.21	8.90	— 0.31
Refractive index	40.2	39.4	— 0.8

The deficiency in the milk yield of recently infected animals was 30 per cent., in the case of chronically diseased cows it was about 13 per cent., *i. e.* sufficient to be of economic importance.

The following is a summary of the facts:

1. The milk of cows suffering from infectious catarrh of the vagina shows on an average a decrease in specific gravity and in solids not fat

content and a lower refractive index, but on the other hand, the fat content is increased.

2. Thus this milk would be passed as excellent in quality, unless the data obtained by its examination were compared with those referring to the product of healthy cows.

3. It appears, from the data obtained, that a change in the methods hitherto adopted for milk control is not necessary if all the characters of milk are considered together.

61 - A Quick Method of detecting Water in Buttermilk.

HÖYBERG, H. M. Ein schnelles Verfahren zur Bestimmung des Zusatzes von Wasser in Buttermilch. — *Zeitschrift für Fleisch- und Milch-hygiene*, Year XXIII, Part 5, pp. 104-107. Berlin, December, 1912.

Hitherto, it has not been very easy to determine whether water has been added to buttermilk or not, especially when it was impossible to prove the presence of nitrate, the latter substance being absent from some waters; further, it may be introduced by the water used for washing.

Therefore in legal proceedings the only method at present employed for judging the purity of the buttermilk is the determination of the solids-not-fat content, for the fat content is too variable to be used for this purpose. The writer proves by his experiments that the solids-not-fat content of buttermilk often sinks below the usually accepted minimum amount without any addition of water, while it often remains higher even when water is added. Also, from the solids-not-fat content it is impossible to determine the quantity of water present.

Another more accurate method of determination must therefore be adopted. Such, for instance, as estimating the specific weight of the butter milk and whey.

As the thick consistency of the former prevents its specific weight being determined in the usual manner by an areometer, the writer obtained it from the whey contained in the buttermilk.

He heated ½ litre of buttermilk to 50° C., pressed the buttermilk through a piece of thick linen, and cooled it to 15° C. He then determined the specific weight in 112 experiments by means of an areometer and obtained the following data.

The whey of unadulterated buttermilk has a specific gravity of from 1.0250 to 1.0275.

If the specific gravity of the whey is below 1.0250, the buttermilk may be regarded as adulterated with water.

Further, the ratio between the specific gravity and the amount of water added remains constant, *i. e.* the specific gravity falls on an average 0.0010 with every 5 per cent, addition of water; thus this method affords a means of determining with some accuracy the amount of water which has been introduced. In this way, adulteration in buttermilk samples can be quickly, easily, and sufficiently accurately detected.

In conclusion, the writer remarks that it is necessary to distinguish between direct and indirect watering of the buttermilk; the latter occurs from steam being passed through, or if ice is added to the cream in order to cool it.

Further, water may be introduced if the milk utensils, *e. g.* the cooling apparatus, are not water-tight.

62 - A Study of the Gases of Emmental Cheese.

CLARK, WILLIAM MANSFIELD: *U. S. Department of Agriculture, Bureau of Animal Industry.* Bulletin 151. September 7, 1912.

The writer aims at ascertaining by means of exhaustive experiment the nature of the gases present in the so called " eyes " in Emmental cheese, and of those which cause the formation of these cavities. He succeeded, by means of apparatus devised by himself, not only in collecting the gases in the eyes, but also those in the " pinholes ". These he subjected to qualitative and quantitative analysis.

In normal eyes, the gases consisted of carbon dioxide and nitrogen with traces of oxygen and hydrogen. Spectroscopical investigation also showed that hydrogen can play no part in the eye formation, as no significant amount of hydrogen was found, and it was proved that this gas had not escaped detection from its rapid diffusion out of the body of the cheese. The production of hydrogen was however very active while the cheese was in press, and small percentages of this gas generally accompanied abnormal eyes. This is probably due to a slight initial gaseous fermentation of the sugar. It has, however, been shown, that all traces of sugar have disappeared by the time of the formation of normal eyes, and further, that sugar fermentation and the formation of hydrogen have nothing to do with the production of these cavities. In the ripening process of the cheese, therefore, two types of gas formation are to be distinguished. The one is highly detrimental and is accompanied by hydrogen, while the other is demanded in a good Emmental cheese. One is dependent upon the presence of sugar, the other occurs in the absence of sugar.

With regard to the oxygen, the writer found that a large amount of this gas was absorbed by the cheese, but only small traces of it were found in the cavities. Oxygen is also absorbed from the air which penetrates the cheese, but the nitrogen remains in the eyes.

Emmental cheese has a low permeability for air and for gases in general, especially when it is dry. Only a small amount of air can penetrate into the cheese, and since the oxygen contained in this small quantity of air is absorbed, it follows that the conditions in the interior of the cheese are eminently favourable to the development of anaerobic bacteria.

The nitrogen which is found in the mixture of gases in the eyes is also partly derived from the air which penetrated the cheese, but mostly, as was proved by experiment, from that contained by the curd. It can, however, be considered certain that no free nitrogen arises in the formation of the eyes.

Only carbon dioxide plays an important part in the formation of these cavities and forms the greatest part of the mixture of gases contained in the latter. Von Freudenreich and Jensen considered that the formation of carbon-dioxide in the eyes was due to the activity of propionic bacteria, but the writer proved mathematically and practically that the action of these micro-organisms is not sufficient to account for the large amount of carbon dioxide which is formed during the ripening of the cheeses, for the whole amount of the gases formed not only occurs in the cavities but also saturates the body of the cheese. Further, a large increase in the formation of carbon dioxide takes place if the cheese is manipulated with sterilized instruments.

If the bacteria are indeed concerned in the production of carbon dioxide, the question still remains whether they are sufficiently localised to cause the eyes. The writer suggests that there are two phases in the formation of normal eyes, a saturation of the body with carbon dioxide, and an inflation of the eyes. He allows that the part played by anaerobic bacteria in gas production is an important one, but leaves it an open question whether their action in the formation of eyes is primary or secondary. The writer notes in this connection that a number of cheeses made with artificial rennet, which did not contain propionic acid bacteria, began a normal eye formation, but as this beginning seldon developed into normal holing, he asks if it is not possible that the reaction which started the eye formation was rendered inadequate because the gas-producing propionic bacteria, which might have saturated the cheese with carbon dioxide, were absent. He is, however, of opinion that exhaustive research and the qualitative and quantitative investigation of the gases at every phase of cheese-ripening can alone solve the question.

WOOL INDUSTRY

63 - Insects Infesting Woollen Tops.

FROGGATT, WALTER W. — *The Agricultural Gazette of New South Wales*, Vol. XXIII, Parts 6 and 10, pp. 491-492 and 900 + 1 plate. Sydney, June and October, 1912.

In the first of these articles the writer ascribes the injury done to a package of woollen tops, which had been shipped from New South Wales to Japan, to a cosmopolitan carnivorous species of the *Cleridae*, *Necrobia rufipes*, called the "Red-legged Ham Beetle" in England, because it feeds upon ham, etc.; in the Islands it is known as the "Copra Bug", as it devours dry coconut kernels. This insect was determined by the writer from specimens of infested tops sent to him from Japan.

After the publication of his account, several authorities among the shipping people observed that the woollen tops were destroyed, not by the "Copra Bug," but by a weevil. In a second lot of samples of tops sent from Japan, the writer discovered other larvae different from those which had been present in the first consignment; these proved to be the larvæ of *Dermestes cadaverinus* ("Cosmopolitan Skin Weevil"). This destructive insect is plentiful in sheep-breeding centres and in hide and skin stores. *Dermestes cadaverinus* occurs most commonly in ships which trade between Australia and the Far East. It is not only necessary to fumigate the holds of such vessels as carry hides, skins and bones, but further, all the loose fittings should be examined and removed if infested with these insects.

64 – "Vin de Goutte" and "Vin de Marc".

WINE-MAKING

Roos, L. Vin de Goutte et Vin de Marc. — *Annales des Falsifications*, 5th Year, No. 49, pp. 509-517. Paris, November 1912.

The writer gives the name of "vin de goutte" to the wine which flows by itself from the grapes, whether the latter are crushed or not, while "vin de marc" is that which remains in the solid particles of the fruit after draining and which is extracted, either by pressure before or after fermentation, or by diffusion after fermentation alone.

There is a great difference in composition between these two kinds of wine made from the same vintage, and notably in the alcohol content, which might lead to the suspicion of adulteration. The method of wine-making used, the system, or the completeness of the crushing, the development of the mechanical apparatus attached to the crusher for separating the juice or removing the stalks, the submerged or the floating pomace systems of fermentation, and the degree of the ripeness of the grapes, are all factors in determining the differences, which are often great, between the "vins de goutte" and "vins de marc" from the same vintage, *i. e.* between the "vins de goutte" and those which are, later on, pressure wines or diffusion wines according to the process employed for exhausting the pomace.

M. Bouffard has already obtained, by means of laboratory experiments, a difference of 0.6 between the average degrees of two pressure wines from the same vintage, of which part was thoroughly, and the other only half crushed.

The writer has observed numerous cases where "vins de marc" resulting from the method of mixed wine-making, by which it is proposed to make from the same vintage and at the same time, white or rose-coloured and red wine, have an alcohol content 2 or 3 per cent lower than that of the "vins de goutte". If the different parts of the grape are examined, it will be seen that the decrease in alcohol is due to the vegetation water of the fruit occurring in part of the grape only. According to M. Girard and Lindet 1000 kg. of Aramon grapes furnish:

Grape stalks	40.7 kg.
Berries	959.3 »

The percentage composition of the grapes is as follows:

Pulp.	88.81
Skins	9.45
Pips	1.74

These figures, if applied to 959.3 kg. of grapes, give for 1000 kg. of a complete vintage:

Stalks	40.70 kg.
Pulp	851.95 »
Skins	90.65 »
Pips	15.69 »

The 851.95 kg. (1874.29 lbs) of pulp, cf a density above unity, correspond to 800 litres (176 gallons) of juice. Thus, if from such a vintage when crushed, on the first operation 500 litres (110 gals.) of juice are obtained, there still remain 300 (66 gals.) in contact with the solid parts of the fruit forming the pomace of this first pressing. The composition of these portions is as follows, according to the same analysis of M. Girard and Lindet.

The percentage composition of the Aramon skins is considered to be:

Water	76.80
Other substances	23.20

It should be noticed that the other substances, summarized at 23.20, do not include sugar. The percentage composition of the pips, which do not contain sugar, is:

Water	34.82
Other substances	65.18

That of the stalks, also without sugar, is:

Water	79.66
Other substances	20.34

After complete fermentation, lasting long enough to allow of cellular interchanges, and finally of the pomace becoming impregnated with a homogeneous liquid, all the vegetation water of the skins, pips, and stalks unites with the remaining 300 litres (66 gals) of juice.

Thus the amount of water would be for the 1000 kg of the grapes under consideration:

For the skins	90.65	×	0.768	=	69.62 kg.
» » pips	15.69	×	0.348	=	5.46 »
» » stalks	40.7	×	0.796	=	32.42 »
			Total . . .		107.50 kg.

The 300 litres of fermenting juice are thus united, by means of intercellular exchanges, to the 107.300 litres of water to form a homogeneous whole. If also the amount of sugar present is as allowed for by MM. Girard and Lindet — 14.09 per cent. of the pulp weight — the juice in question would contain 150 gr. per litre, capable of giving a "vin de goutte" of $\frac{150}{17.5} = 8.57$ per cent.

The liquid impregnating the pomace consists of: 300 litres of juice at 15 per cent. of sugar, plus 107 litres of water of vegetation from the different organs, and will only be capable of furnishing 3×8.57 of alcohol, or 25.71, which, divided between 407 litres, gives an alcohol content of 6.61 per cent.

In this case, the " vin de goutte " extracted for white wine will show a difference of 1.96 per cent of alcohol in favour of white " vin de goutte " compared with red " vin de goutte ", whether obtained by pressure or by diffusion.

This coincides with what is often found in practice, and even the difference between " vins de marc " and " vins de goutte " may be still more accentuated, if instead of limiting the extraction to 500 litres per 1000 kg., it is extended to 550 or 600 litres, or even more.

The method and the completeness of the crushing, or still more of the removal of the stalks, causes great differences in the composition of the pomace and thus in that of " vins de marc ". The result of perfect crushing, whether performed by the crusher alone, or by crushing followed by different mechanical operations, is to remove the pulp entirely from the berries and thus to make the pomace much poorer in sugar, as the latter substance is derived only from the adherent pulp, and is also much lighter. This difference of composition and of density has a notable influence upon the quality of red " vins de marc " according to the fermentation method adopted.

These differences are attenuated by the separation of the stalks, as this operation removes from 2 to 5 per cent. of the water of vegetation.

If the submerged-pomace fermentation system is used, whatever the state of the grapes which are crushed, there is no difference between " vin de goutte " and " vin de marc ". For all the water of vegetation is found in the mass, the intercellular exchanges take place during the whole fermentation period, and this water of vegetation is distributed throughout the liquid, especially if the liquid has been well mixed during the fermentation process. If, however, it is a question of floating-pomace fermentation, differences occur, and these vary according to whether the crushing has been complete, or not, whether the fermentation, always with floating pomace, is carried out in tuns, or in vats with vertical sides; whether or not the mixing by drawing liquid from the bottom of the vessel and pouring it in at the top during fermentation, has been practised or not, and also according to the ripeness of the grapes.

Tha shape of the vessels, tuns or vats, may be of importance, in so far as it hinders or allows the rising of the pomace and the formation of the " cap ".

In tuns, which are normally full, the submerged portion of the pomace is always larger, approaching nearly to the submerged-pomace type of fermentation. The difference betwen " vins de goutte " and " vins de marc" would be very slight and often almost nil, if it were a question of a not completely ripe vintage, which has undergone a merely rudimentary pressing; the " vins de marc ", whether obtained by pressure or diffusion, are *more alcoholic* than the " vins de goutte ". This is explained by the fact that the accumulation of sugar in the grape proceeds from the periphery to the centre during the ripening. Also, if it is a question of a vintage which has been little crushed, it is just the poorest part of the pulp which is expelled: and this forms the "vin de goutte ". The pulp which adheres to the skins may be much richer in sugar, and able to more than counteract the influence of the water of vegetation contained in the fruit.

When fermentation takes place in vats with vertical sides, or in partially filled tuns, the immersion of the pomace may be very variable, and the difference between " vin de goutte " and " vin de marc " will be increased with the completeness of pressing, the pomace being lighter and the immersion least. This difference will also be augmented by the fermentation being shorter after the formation of the pomace cap, as the immersion increases till, in time, it is complete ; and also by the greater ripeness of the vintage, for when the grapes are quite ripe, the pulp adhering to the residuum is no richer in sugar then that which forms " vin de goutte ".

In vats and tuns alike it may also happen in the case of unripe, little-crushed grapes, that the " vin de marc " is richer than the " vin de goutte ".

These are undeniable facts and relatively newly discovered, as they could not be observed while wine-making methods and apparatus were primitive. But, whatever decrease there may be in alcohol content, " vins de marc ", whether the result of pressing or diffusion, should not present the habitual characteristics of watering. In fact, if the skins, stalks and pomace bring sufficient water of vegetation to cause a diminution in the alcohol content, they also supply soluble acid and neutral compounds, which enter into the composition of the wine and give it normal analytic characters.

OTHER INDUSTRIES DEPENDING ON PLANT PRODUCTS.

65 - Peanut Butter.

BEATTIE, W. R. — *U. S. Department of Agriculture, Bureau of Plant Industry*, Circular No. 98, 14 pp. Washington, October, 1912.

In the United States several large factories and a number of smaller ones are now devoted to the manufacture of peanut butter with which to supply the rapidly increasing demand. Some of the larger factories are almost models in their construction, equipment and management, while many of the smaller establishments which have no elaborate equipment, are turning out an excellent product.

Peanut butter consists merely of fresh roasted peanuts ground fine and salted. It is calculated that in 1911 about 1000 railway cars of shelled peanuts, or 1 000 000 bushels, were used in the manufacture of this food.

In order to produce high class peanut butter the best of materials and the utmost cleanliness are necessarry; consequently it should never be prepared in premises attached or adjacent to a peanut cleaning establishment, on account of the dust.

In the United States two distinct types of peanut are grown, the Virginia or Jumbo (including the varieties known as Virginia Bunch, Virginia Runner, and North Carolina or Wilmington) and the Spanish type (including the true Spanish, Georgia Red, Tennessee Red, and Valencia).

Three grades of shelled goods of both types are prepared. In each case No. 1 consists of whole kernels, No. 2 of split kernels and No. 3 of the finely broken and badly shrivelled ones. The use of the latter in the manufacture of the butter should be discontinued. The best grade of the Spanish and Valencia and the cheaper grades of the Virginia type of peanuts are commonly employed for the production of peanut butter. An admixture of the Spanish peanuts gives the product a greater degree of smoothnss, but butter made from Spanish peanuts alone contains too much oil. The writer suggests the posssibility of using them after having extracted from them 8 to 10 per cent. of the oil by pressing. Peanut butter of the proper consistency contains 41 or 42 per cent. of fat.

The successive manipulations that the peanuts are submitted to for the preparation of the butter are the following:

1. Roasting at about 160° C. for 30 to 35 minutes.

2. Rapid cooling by a cold air blast.

3. Blanching, that is removal of the outer red skins and the germs. This is accomplished by means of blanching machines consisting of a set of brushes revolving against a corrugated plate.

4. Hand picking for the removal of small pebbles, discoloured or inferior nuts, etc.

5. Blending of the different kinds of peanuts used.

6. Salting with 1 ½ to 3 per cent. in weight of salt.

7. Grinding to a fine granular form.

8. Bottling and packing.

The writer describes with full particulars each of the above operations as well as the necessary plant, and gives illustrations of some of the model factories.

PLANT DISEASES.

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

66 - Royal Decree of Nov. 8, 1912, regarding the Regulations for the Creation of a Phytopathological Service in Belgium.

Arrête royal du 8 Nov. 1912, portant règlement concernant la création du Service phytopathologique special, l'inspéction des cultures horticoles et des pepinières, ainsi que l'importation et l'exportation des produits de ces cultures et plantations.—*Moniteur Belge*, Year 82, No. 322, pp. 7458-7464. Bruxelles, Nov. 17, 1912.

Article 12 of the rural code, amended by the law of June 27, 1912, is formulated in the following terms:

"The measures to be adopted for the destruction of caterpillars and insects and for the uprooting of thistles and the destruction of injurious plants, are determined by Royal Decrees. Those which have for their object the prevention of the introduction into the country or of the propagation of insects or other animals, or of cryptogams and other plants, which are injurious to crops, are likewise regulated by Royal Decrees."

For the execution of this law, a decree was passed on Nov. 8, 1912, as follows:

§ 1. *Special service of phytopathological inspection.* — An inspector is entrusted with the direction and scientific control of the special service of phytopathological inspection. Assistant experts are appointed to aid the inspector in drawing up the necessary certificates for the dispatch of horticultural plants abroad. (Art. 1).

All matters of the special service of inspection, both in the interior of the country, or on the frontiers, are regulated by Ministerial Decrees (Art. 2).

Every owner or tenant who cultivates or keeps horticultural or nursery plants under glass or otherwise, is obliged to permit the grounds to be visited by the inspector of the special service of inspection, or by the experts mentioned in Art. 1. All dealers in the plants under supervision are required to allow the contents of the parcels of plants for export to be examined at any time (Art. 3).

§ 2. *Transit.* Art. 4 — "Plants imported for transit are subject only to the conditions prescribed by Art. 6 of the Royal Decree of Sept. 15, 1885, for the execution in Belgium of the regulations of the International Phylloxera Convention."

Art. 5. — " Independently of the formalities prescribed by the Royal Decree mentioned in the preceding article, the exportation and importation of the plants referred to in Art. 3 are regulated by the following provisions. "

§ 3. *Importation.* Art. 6. — " The importation of horticultural or nursery plants attacked by insects or plants injurious to crops is forbidden."

Art. 7. — " The Minister may order the return of such plants, or restrict their importation to certain Customs Offices named by him with the common consent of the Minister of Finance. "

Art. 8. — " In certain serious cases, he may forbid the entry of certain species or varieties of the said plants coming from the countries he names."

" In default of taking this measure, he can order the production of certificates to the effect that the plants presented for import come from cultivations free from injurious insects or plants, and that the plants sent are free from such insects or plants."

" The examination of the plants sent can take place at the frontier, or on arrival. "

Art. 9. — " In cases where the plants dispatched to the interior of the country are recognized as being attacked by injurious insects or plants, the Minister has the right to decree their destruction at the cost of the importer, who is not entitled to any indemnity. "

§ 4. *Exportation.* Art. 10. — " No horticultural or nursery plants may be sent to foreign countries, unless they have been certified as entirely free from injurious plants and insects by the Inspection Service organized according to Art. 1.

Art. 11. " The grower, whatever his status, of such a cultivation of plants as is mentioned in Art. 3, where the special Inspection Service testifies to the presence of an insect or plant, which it recognizes as harmful to plantations, is held responsible for its destruction. "

" Until the destruction of the injurious insect or plant is effected, the Inspector of the Special Service is required to refuse the phytopathological inspection certificate mentioned in Arts. 14 and 15. "

Art. 12. — " All plants destined for the United States, or for any other country determined by the Minister, have, before exportation, to be provided with a certificate to the effect that they come from sources free from plants and insects injurious to cultivations. "

" Such goods as do not comply with this regulation, cannot be admitted for transport ".

" When the plants sent have not all been grown by the sender, the latter is required, under penalty of the application of Art. 17, to assure himself in every case that the other plants also come from sources which have also been certified by the special Service as free from injurious plants and insects. To this end, the sender has a right to demand the production of the inspection certificate which the grower has received ".

Art. 13. — " In special cases, the Service Inspector can, on condition that the persons interested conform to his instructions, give permission to send plants exported directly from abroad together with the products of cultivations which have conformed with the provisions of Art. 10 ".

Art. 14. — " The Certificate mentioned in Art. 12 is granted by the Inspector of the Special Service. Its granting depends upon an inspection certificate drawn up by the said Service and affirming that the cultivations have conformed with the regulations contained in Art. 10 ".

" The Minister fixes the time for which this certificate is valid ".

Art 15. — " The inspection certificate can be obtained gratuitously by every grower of horticultural plants on application to the Inspector of the Special Service and on observing the conditions laid down by the Minister ".

Art. 16. — " At certain times, which are fixed by ministerial decree, the Inspector of the Special Service, aided by assistant experts, inspects the cultivations of the persons making the declarations and carries out the necessary investigations ".

" When the cultivations can be considered free from injurious plants and insects, the Inspector of the Special Service grants the inspection certificate ".

" The latter is refused, when, among the inspected places, plants are found attacked by injurious insects or plants ".

Art. 17. — " The inspection certificate is refused, or withdrawn, in the case of the non-observance of part 3 of article 12, or when the cultivator of the cultivations to be inspected only determines these partially, or does not render the Special Service Inspector the necessary assistance to enable him to carry out the requisite investigations ".

" Such refusals are announced to the Minister by the Inspector of the Special Service within three days. The same procedure is observed in the case of a refusal of the certificate based on part 3 of the preceding article ".

The last § deals with the research of the infringements of the regulations and the penalties incurred by non-compliance.

A ministerial decree of Nov. 9, 1912, regulates the inspection of horticultural and nursery cultivations; to this is appended a circular, addressed to the Governors of the Provinces, dealing with the above decrees.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

67 - On the Effect of Falls of Temperature on Vines, in Connection with " Bramble-leaf " (1).

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

PETRI, L. Ricerche sulle cause dei deperimenti delle viti in Sicilia.

I. — Contributo allo studio dell'azione degli abbassamenti di temperatura sulle viti in rapporto all'« arricciamento », 210 pp., 97 figs. Roma, 1912.

According to the writer certain solid endocellular fibres are constantly found in the tissues of all those vines in Sicily or on the mainland which are sickly in consequence of the attacks of " bramble-leaf " or " roncet ". These fibres are found both in American and European stocks, and in the grafted as well as in the ungrafted vines, and mostly in the above ground parts of the plants

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(1) See also No. 1349, *B.* Sept. 1912. (*Ed.*).

These formations are identical with those already well known in the wood of conifers (" Balken " of Sanio). These endocellular fibres are not formed in vines affected by other forms of distortion. Their formation precedes the exterior manifestations of bramble-leaf, and similarly to these, they are transmitted by cuttings; their formation is caused by falls of temperature during the growth of the plant.

The distortion of the shoots produced directly by late frosts is not the same, morphologically or genetically, as that produced by bramble-leaf. The action of cold, necessary for the formation of these fibres, does not produce directly distortion of the shoots. The sensibility of the cambium and of the other tissues to this particular action of the cold increases after they have once been injured.

The process of the formation of the fibres may be considered as the consequence of the deviation of a normal process which takes place during mitosis under the influence of the fall in temperature. This perturbation lasts, and is transmitted also to the cells which originate from those first injured, independently of a repetition of the cold.

Those conditions of structure of the soil and of aspect of the vineyard which usually favour the ordinary ill effects of cold, and which have been found to further the appearance of bramble-leaf, may be considered as predisposing and perhaps complementary factors in the special action of cold in forming the endocellular fibres.

It is very probable that the manifestations of bramble-leaf and the endocellular fibres are effects of one and the same cause, but hitherto this has not been demonstrated experimentally.

The practical measures suggested by the facts which have been ascertained by the writer's researches concern principally the necessity of establishing experimental nurseries with a view to finding the means of protecting the mother plants from the injurious effects of the coastal climate.

BACTERIAL AND FUNGOID DISEASES

FUNGI

68 - On the Weather Conditions that favour the Breaking out of Vine-Mildew.

SÁVOLY, F. Ueber die Lebensansprüche der Peronospora der Rebe an die Witterung. *Centralblatt fur Bakteriologie, Parasitenkunde und Infektionskrankheiten. Zweite Abteilung*, Vol. 35. Nos. 17-19, pp. 466-472. Jena, October 30, 1912.

In 1907 Prof. Gy. v. Istvánffi, Director of the Ampelological Station of Budapest, being engaged in research on the life history of the vine mildew, decided to study more closely the very important influence that the weather has upon this fungus. What was contemplated was not a laboratory experiment, nor the determination of the special conditions of a limited wine-growing district; but an experiment on a grand scale which should afford a sound arithmetical basis to the relation existing between the attacks of mildew and the course of the seasons in the whole of Hungary, taking into consideration the great diversity of conditions prevailing in the various parts of the country.

The vine thrives well, at suitable altitudes, in the whole of the kingdom, the general configuration of which may be likened to that of a huge basin, the bottom of which is formed by the extensive Alföld, a plain situated at from 80 to 100 metres (270 to 330 feet) above sea level, and the sides by the chain of the Carpathians with the gentle slopes of its foot hills. Whilst the isohyetose lines, both the yearly ones and those covering longer periods, are situated concentrically round the Alföld, which is the relatively driest part, the isotherms run almost parallel to the parallels of latitude.

A future publication will contain all the details of the experiment, of the methods employed and of the results obtained; this paper is only a preliminary communication.

Beginning with the year 1907, all the data given by the agricultural press of the country during the preceding ten years on the relation between the outbreaks of mildew and the weather were collected and examined. The result was a confirmation of the well known fact that the disease prevails and is especially severe in wet years. Another observation of greater importance than the above general result was the recognition of the individual behaviour of some regions, distinguished by special meteorological conditions, towards mildew.

As meteorological data, those supplied by the Government stations were utilised; the data on the mildew invasions were collected with the assistance of thousands of farmers living in all parts of Hungary, who were requested to forward to the Royal Ampelological Station suspected or diseased parts of vines on the very first suspicion or appearance of mildew. The material thus collected was examined at the Station. Stress was laid upon collecting data referring to the first outbreaks of the disease, inasmuch as only these have any value in establishing a connection between mildew and the course of the weather. In order to make sure of the exactness of the data collected, the administrative district was considered as the unit of area in respect to the outbreak of the disease, and it was held to be infected from the date on which the first notice of the disease was sent in. The confirmation of the intelligence was given by the subsequent notices which followed each other, from the same district. On the other hand, the probability that one information really gives notice of the first appearance of the disease diminishes as summer wears on; and the notices act as a check upon each other when in successive years those from neighbouring districts come in in the same order. In such cases the belief is justified that certain external conditions exist which favour the appearance of mildew earlier in some localities than in others.

In order to diminish the probability of error, the dates of the first appearance of mildew were grouped in periods of unequal length, each of them comprising a greater number of days as the season wore on, and thus offered an increasing probability of likelihood. The first period is of 2 days, the second of 3, the third of 10, the fourth and the fifth of 15 each, the sixth and the seventh of 31; the total period extending from the middle of May to the end of August. Further, all the data were considered only when grouped together in averages. For these detailed investigations the material collected during 1910 and 1911 was used. Two thousand cases of mildew were recognised in the material sent to the Ampelological Station; of these, two hundred in each of the two years indicated the outbreak of the disease in a given district. The dates of the first appearance of mildew were grouped in periods of time gradually more distant from each other and plotted out on a map, surrounding each group with a line. The curves thus obtained are called by the author the "isophanes" of mildew.

The graphical representation of the dates on which mildew appeared show that the same dates or those near to each other are connected in a series without interval. This proves undoubtedly that the contemporary outbreak of mildew is caused by contemporary weather conditions favourable to infection, and it is easy to recognise in the sinuosities of the isophanes the lines which mark the quantities of rainfall in each rainy period.

This forms a first basis for the valuation of the biological value of climatic conditions in regard to mildew.

The isohyetes of the greater quantities of rainfall in April and at the beginning of May nearly coincide with the lines of the first isophanes. In the same manner as the isohyetes of given periods of rain represent diminishing quantities, the isophanes represent successive and increasing periods of time. Consequently the quantity of rainfall influences the time of the outbreak of mildew, or in other words, the spread and probably the intensity of the disease are determined by the gradient of the rainfall. Inverting the postulate, it may be said that from the gradient of the rainfall in a district the first appearance and the trend of the further course of the parasite may be deduced.

It has been further observed that the later isophanes enclose the earlier ones: it may therefore be affirmed that, within the limits of Hungary, the fungus does not make its appearance here and there at hazard, but that it follows an uninterrupted course which seems to depend upon certain determined circumstances.

As is proved by the isophanes, the spread of the disease depends to such an extent upon climatic conditions and the physiographical character of the soil, that one might almost deny the efficiency of the means of control if it were not for the fact that it is just the incomplete or delayed application that explains how the disease can continue its course, though with diminished intensity.

As is to be expected, the condition and configuration of the land exert a great influence on the isophanes: Extensive wooded regions, or mountains on which the vine does not grow, hinder the spread of the disease, while river valleys, low-lying lands liable to floods, or those subject to mists, favour it.

As regards the meteorological factors, the temperature and the quantity and frequency of rain were recorded in every locality and for each period after the 1st of April, that is during the time in which the outbreak of mildew is possible.

Since equal intervals of time, though they lend themselves to meteorological observations, have (as the writer demonstrated by experiment) no value in connection with the life-history of mildew, because they almost always comprise days in which the weather is of the most varied and even opposite character, the writer limited himself to the factor rain, and divided the time into periods of rainy days and of dry days. He determined the average number of rainy days, the frequency of the rain, the temperature of every single locality in which mildew appeared, for all the periods both of rainy and of fine days from the 1st of April up to the date of the outbreak of the disease.

With the single averages for each isophane he calculated separately the average for that isophane during the dry periods and the rainy ones, and then for the whole period from the 1st of April up to the date of the appearance of mildew on that isophane.

By multiplying this number by the number of days that elapsed between the first of April and the date of the real outbreak of mildew, a coefficient is obtained in which each factor is represented.

This coefficient is called by the writer a *bios*. Though it may not have an absolute value, its practical utility cannot but be recognized. In 1911 mildew appeared on the 15th of May. Calculating the values of the bios for every isophane, the following results were obtained:

isophane	I	II	III	IV	V	VI	VII
bios . .	631	625	522	427	405	400	256

There is thus an uninterrupted diminution in the number of the bios the further one goes from the first isophane, in which mildew broke out on the 15th of May. Admitting that the course of the weather is enough to cause the outbreak of mildew in the belt of the first isophane, when the value of the bios was 631, it may be asked at what date will the climatic conditions in the meantime prevailing in the belts of the other isophanes cause the outbreak of mildew in them? With the help of the above bios a simple arithmetical calculation shows that in respect to the first isophane mildew will appear in the

II	III	IV	V	VI	VII	isophane in days.
45	54	66	70	91	111	
(48)	(51)	(62)	(77)	(92)	(123)	

The numbers in brackets are those of the days that really passed before mildew broke out.

The same concordance between calculation and practical observation was recorded in the year 1910 and in the first half of 1912; during this latter period, in almost all the localities infested by mildew the value of the bios ranges from 600 to 650; and already in the month of May it was possible to foresee the course that the disease really took and the extent to which it spread.

Without the intention of generalizing his results, the writer concludes by expressing the wish that similar researches should be undertaken in other countries also.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

69 - **Fungi injurious to Rice in the Philippines.** — See above, No. 27.

70 - Treatment for *Bremia Lactucae, Peronospora effusa* and *Heterosporium variabile* on Vegetables (1).

SCHNEIDER, NUMA. Traitement du Meunier des Laitues et Romaines et du Mildiou des Epinards. — *Revue Horticole*, Year 84, No. 21, pp. 493-494. Paris, Nov. 1, 1912.

Lettuces and cos lettuces raised under glass after October for forcing purposes are often attacked by *Bremia Lactucae* (or *Peronospora gangliiformis*). The writer has, during some years, found that a good method of controlling this disease is to cover old forcing beds, previously broken up and levelled, with an inch or more of pulverised white wood charcoal, or twig charcoal, sowing the seeds not too deeply and covering them also with a thin layer of powdered twig charcoal. The hot-beds on to which the plants were pricked out, were also covered with a layer of powdered charcoal, which was pressed down firmly so as to keep the leaves of the plants quite away from the soil. The treatment was completed by a sulphur application on a fine day at the end of November, or in December. The same treatment can be applied to cauliflowers, raised under glass at the same season.

Dusting with sulphur has been found an efficacious remedy in the case of *Peronospora effusa* and *Heterosporium variabile*, parasites of spinach; as the first application had been removed by the rain, the process was repeated a second time, using a special bellows, and in such a manner as to reach the lower surface of the leaves.

At the time of gathering, only a very small amount of sulphur adhered to the spinach leaves, and this disappeared after they were well washed.

The necessary quantity of sulphur for the treatment is very small.

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(1) See also No. 418, *B.* Feb. 1912. (*Ed.*).

71 - Infection Experiments with *Thielavia basicola* on Ginseng.

ROSENBAUM, J.: in *Phytopathology*, Vol. II, No. 5, pp. 191-196 + plates XVIII and XIX. Ithaca, October 1912.

One of the most common and serious diseases affecting ginseng has been attributed to *Thielavia basicola* Zopf. While several workers in different parts of the United States have observed the fungus associated with the disease, no definite inoculation experiments on this host have ever been reported.

The fungus is very widely distributed and has been associated with a wide range of hosts belonging to 11 entirely different families. It has been reported from Germany, Russia, Belgium, England, Italy and Korea. In the United States it has been reported from several States. In the case of ginseng, the fungus is able to attack plants of all ages, being most severe on seedlings, where it is known by the growers as "fiber rot" or "end rot." It not only attacks the roots of seedlings and older plants, but has been found causing cankers an inch or more in length on the stems. Most commonly these occur at the point where the stem emerges from the ground. These cankers at first cause a discoloration, followed by a drying and splitting of the stem in a longitudinal direction, allowing it to break over. The disease has been observed to attack the ginseng plant in soils of widely different physical characters; in many cases it seems to be just as severe on new land as on soil which has previously grown several crops.

The writer reports inoculation experiments (inoculations of seedlings; inoculation of ginseng in the soil; inoculations on stems) of *Thielavia basicola* obtained from three different hosts, namely cotton, tobacco and ginseng. The conclusions arrived at from the results are the following:

1. From comparison of cultures from different hosts on various media, from infection experiments and from measurements of spores and mycelium, it appears that the forms of *Thielavia basicola* Zopf found on the three different hosts, cotton, tobacco and ginseng, are identical.

2. While infection without previous injury to the ginseng or tobacco is always obtained in the case of young plants, this is apparently not the case where older plants are used.

3. The fungus is able to attack the aerial as well as the underground parts of the plant; at least this proved to be the case with ginseng.

72 - Apple Leaf Spot.

BROOKS, CHARLES and DE MERITT, MARGARET: in *Phytopathology*, Vol. II, No. 5, pp. 181-190 + 1 plate. Ithaca, New York, October 1912.

The paper under review is a report upon the cause and nature of apple leaf spot and includes data and discussion in regard to inoculation experiments with various fungi, studies on different forms of *Sphaeropsis malorum*, and experimental work on time of infection, influence of cultivation and methods of control.

Spray injury, intense sunlight following showers, frost, and a number of different fungi, including *Coniothyrium pirina* (Sacc.) Sheldon (formerly known as *Phyllosticta pirina*), *Phyllosticta limitata* Pk. and *Sphaeropsis malorum* Pk., have been credited with causing the disease. Inoculation experiments were made by I. M. Lewis in 1908-1909 with spores from pure cultures of *Sphaeropsis malorum*, *Coniothyrium pirina*, *Coryneum foliicolum*, *Alternaria* sp. and *Fusarium* sp., which had been isolated from the affected areas, but only negative results were obtained.

The writers have made a study of *Sphaeropsis malorum* from different sources and have isolated three strains or types that are particularly distinct. The first has broadly conical unilocular pycnidia and produces oblong spores measuring 12 × 26 to 38 μ; the second strain produces egg-shaped spores measuring 14 × 23 μ; the third is characterised by a distinctly multilocular pycnidium; all three forms are ostiolate. The first strain is the most common on cankered limbs, but pycnidia of the second form were found several times in such positions.

The cultures obtained from leaf spots always produced pycnidia of the first form.

Only the first form of pycnidium wes found on the fruits of apples and quinces in the field. All three forms were obtained in cultures made from spots on apples, but the first was much more common than either of the others.

From the inoculation experiments made with the three strains on the foliage and fruit, the writers conclude that: 1. The leaf spot of apples as it occurs in New Hampshire orchards may be produced by *Sphaeropsis malorum* Pk. and is probably largely due to that fungus. 2. Of the several strains of *S. malorum* which may be obtained, the large-spored form is largely responsible for the production of leaf spot. 3. Infection may occur from the time the leaves unfold till the last of August. 4. Cultivation, spraying and the removal of cankers are important in the control of the disease.

Either Bordeaux mixture or lime-sulphur is an efficient remedy for the disease; but as under New Hampshire conditions Bordeaux often injures the leaves of Baldwin and other varieties, lime-sulphur seems to be more satisfactory.

73 - A new *Gnomonia* on Hickory Leaves.

WOLF, FREDERICK A: in *Annales Mycologici*, Vol. X, No. 5, pp. 488-491 + pl. XVI. Berlin, October 1912.

Upon the leaves of the shag bark hickory (*Carya ovata* (Mill) K. Kock) in the vicinity of Auburn, Alabama, one finds in late summer and autumn an imperfect fungus, *Gloesporium Caryae* Ell. & Dearn. This fungus causes the formation of large diseased areas, 1-2 cm. in diameter, reddish-brown in colour, without a well-defined margin. In case the affected areas become confluent they exceed this measurement in extent and are irregular in outline. Minute brown pustules, the acervuli of the fungus, are present in abundance upon the lower surface of the diseased areas.

Affected leaves were collected by the writer during the autumn and put away to winter out of doors. By May 4th mature perithecia had been formed in the areas occupied the preceding autumn by the *Gloeosporium* stage. Further examination showed that this perithecial stage agreed morphologically with that of the genus *Gnomonia*. This fungus had been cultured from both the conidial and the ascosporic stages. In order to add further proof to the identity of the two forms inoculation experiments were attempted. Inoculation upon hickory leaves with pure cultures of ascosporic material (*Gnomonia* stage) resulted in infection and the subsequent development of the conidial stage (*Gloeosporium*). These conidia, when used in turn for inoculation, resulted in the production of acervuli and conidia. Inoculation in the field with pure cultures of both the ascosporic and conidial stages, made by laying small pieces of the infected material upon the under surface of leaves, produced infection.

The new name, *Gnomonia Caryae* (1), is proposed for this perfect stage. Complete descriptions of both stages of the species and detailed illustrations are given.

74 - Withering of the Plane Tree due to *Gloeosporium nervisequum*.

VOGLINO, P. Il seccume del platano.—*L'Italia Agricola*, Year XLIX, No. 21, pp. 508-509. + 1 coloured plate. Piacenza, Nov. 15, 1912.

For some years past, the plane trees of the avenues of Turin and the neighbourhood have been subject to withering due to the attacks of *Gloeosporium nervisequum*. Hitherto, the fungus has only appeared on the leaves, which it caused to wither along the course of the primary and secondary nerves, the petiole also being affected. The infected leaves fell prematurely at the beginning of spring and the growth of the plant was completely interrupted, but only for a short time, however, for fresh leaves arose from new buds, and a change in the conditions in their environment having taken place they were immune from the attacks of the parasite. In 1912, however, the disease appeared in a more serious form, which had already been observed in other parts of Italy in 1905 and in France during the last few years.

The fungus, instead of attacking the nerves and petiole only, extended its ravages to the nodes from which the leaves arise, and where the axillary buds are formed; it spread along the bark above and below the node, penetrating into the woody tissues, where it produced many black protuberances, which contained the reproductive bodies of the parasite. The axillary buds died, the foliage in some cases was completely destroyed, while the nutrition and further growth of the tree were much impeded.

If the disease made its appearance in this aggravated form for several years in succession, the trees would suffer severely.

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(1) Prof. Geo. F. Atkinson, Cornell University, Ithaca, N. Y., is of the opinion that *Gloeosporium Caryae* Ell. & Dearn is identical with *Discosia rugulosa* B. & C. (*The Author*).

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

75 - The Chief Russian Species of Dodder.

LARIONOW, D. Die Hauptarten der Russischen Seide und ihre Massregeln. — *Annalen der Samenprufungsanstalten am kaiserlichen botanischen Garten zu St. Petersburg*, Vol. I, Part 4, p. 27. St. Petersburg, 1912.

This communication gives a description of the biological characters of *Cuscuta*. The writer considers *Cuscuta* to be an annual plant and attributes its passing the winter to the germination of its seeds in autumn producing winter forms. *Cuscuta obtusiflora*, H. B. K. var. *breviflora* Engelm. occurs in the Government of Astrakan on red pepper, onions and even on potatoes; this species is one of the rarest and occurs sporadically.

C. Epithymum Murr. is met with on *Papilionaceae*, *Labiatae*, *Daphne* and *Crupina vulgaris* and is of very wide-spread occurrence. A classical district in which this species is abundant is the neighbourhood of Balaclava (Crimea).

C. racemosa Mart. has begun to spread in the Governments of Ekaterinoslav and Chernigov. *C. planiflora* Ten. is abundant in the Crimea, Caucasus and Central Asia; the lucerne of Turkestan is much attacked by it. *C. europaea* L., which is common everywhere, injures hops, tobacco, hemp, poplars, alders, stinging nettles and *Lycium barbarum* L.

C. Epilinum Weihe is found on flax in the Baltic Provinces and the Governments of Jaroslav and Kursk, on *Camelina sativa* in the Government of Kiev, on *Lolium* and *Spergula*; it occurs sometimes, but not often, in clover seed.

C. cupuliformis Kroeker is found on garden trees and on lupins. This species, especially in the south, is very wide-spread. *C. monogyna* Vahl. is also parasitic in the south on *Lycium barbarum*, *Prunus Amygdalus*, *Salix*, *Artemisia* and *Helianthus*.

The writer draws attention to the fact that it is necessary to take energetic measures for the control of dodders when the gardens are weeded in the spring. The fields should be ploughed over before sowing with buckwheat and millet, and burning should also be resorted to if necessary.

It is very necessary that seed control stations be established and that sacks be sealed. The writer advises inspection on the frontiers for the purpose of preventing the introduction of dodder-infected clover seed to Russia. The sacks which have been sealed at foreign seed control stations, need not be subjected to inspection.

76 - Bersim Dodder (*Cuscuta aegyptiaca* n. sp.).

TRABUT, L. La Cuscute du Trèfle d'Alexandrie, *Cuscuta aegyptiaca* sp. n. - *Bulletin de la Société botanique de France*, Vol. LIX (Series 4, Vol. XII), 1912, 6, Séances de Juin 1912, pp. 489-491, plate XII. Paris, Nov. 13, 1912.

In 1912, as a result of the importation of bersim (*Trifolium alexandrinum*) seed direct from Egypt, a dodder appeared in Algeria, which is very common in the Egyptian crops and is called by the natives " hamoûl ".

Bersim dodder spreads very rapidly and grows at a remarkable rate. Unless energetically suppressed, this parasite hinders seed production, for it is especially the last spring shoots, which flower and bear the seeds, that this dodder attacks. The pest seems to follow bersim wherever it is cultivated. The species of *Cuscuta* in question was observed for the first time by Lippi, who named it *Cuscuta aegyptiaca*. Later, Fresenius called it *C. arabica* and described a specimen from Sinai ; this name was used subsequently by other writers.

The study of a large number of specimens decided the writer to separate bersim dodder from *C. arabica* Fres. It appeared to him, that the name *C. aegyptiaca* used by Lippi should be resumed to distinguish this dodder; though probably derived from *C. arabica*, it has already acquired red sufficiently distinctive characters to prevent its being confused, even with this very near ally. It is under the name of *C. aegypliaca* n. sp. that M. Trabut gives a systematic description of the plant studied.

77 - On the Properties of Germination of the Seeds of Different Weeds.

GÜMBEL, HERMANN. Untersuchungen über die Keimungsverhältnisse verschiedener Unkräuter. — *Landwirtschaftliche Jahrbücher*, Vol. XLIII, Part 2, pp. 215-331. Berlin, 1912.

The writer has made a series of experiments with regard to the germination properties of various weed seeds : charlock, wild radish, false oat, cornflower, etc.

One result, among others, of these experiments was that the seeds of charlock should be numbered amongst those that germinate best under the influence of light. Comparative experiments made in light and in darkness showed the great importance of the condition of the seeds (age, stage of maturity, etc.) as regards the germination process and the secondary part played by temperature and its variations.

Exposure to strong sunlight may be highly injurious to germination. Desiccation of the seeds, which should be carried at least to the degree of air-dryness, as a rule augments the germination percentage. But at great depths in the soil even a whole period of drought has no influence on germination. Cold had an unfavourable effect on the seeds left on the surface of the soil in the open in winter: false oat, charlock, radish and cornflower. In the case of false oat, injury occurred even when the seeds were covered with soil. The depth at which the seeds germinate, and their development, depend much on the nature of the soil.

Seeds of charlock may be of different colours, but black is their normal one, brown denoting abnormal maturation and arrested development.

the tor might be ploughed out. The turf would require to be knocked about with harrows until dry. It should then be burnt or left until killed by the weather. Flowering should always be prevented by mowing, grazing with sheep, or burning, and young tufts should be grubbed out and burnt when first seen.

INSECT PESTS.

GENERALITIES

79 - Aphid Notes from California.

DAVIDSON, W. M. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 404-411. Concord, N. H., October 1912.

The paper under review reports several plant-lice not heretofore found in California, of which three species are new to science. A few sexual forms are also dealt with and illustrated

The species here recorded are the following:

Cerataphis lataniae Boisd., taken on ferns in greenhouses; *Phyllaphis coweni* Gillette (syn. *Cryptosiphum tahoense* Davidson); *Calaphis betulaecolens* Fitch, whose sexual forms occur in November on cultivated birch; *Calaphis castaneae* Buckton, whose sexual forms occur in early November on chestnut; *Euceraphis betulae* Kalt., whose sexual female is abundant on cultivated birch in November; *Euceraphis flava* sp. nov., not uncommon on the under side of the leaves of *Alnus rhombifolia* Nutt.; *Aphis cardui*, forming colonies on the young growth of several thistles throughout summer; *Aphis atriplicis* L., occurring on the upper side of the leaves of *Chenopodium murale* L., the sexual forms appearing in August; *Aphis salicicola*, abundant on willows throughout the summer, preyed on by the larva of a *Leucopis* (Agromyzidae); *Aphis maidis* Fitch, colonizing corn; *Amphorophora latysiphon* sp. nov., occurring sparingly on the periwinkle (*Vinca major*) and *Convolvulus arvensis; Phorodon carduinum* Walker, on the under side of the leaves of artichoke becoming a pest; very susceptible in California to fungus diseases; *Myzus varians* sp. nov., occurring on wild clematis (*Clematis ligusticifolia* Nutt.); *Amphorophora rubi* Kalt., colonizing the terminal shoots of cultivated blackberry and loganberry and occurring also on the wild thimbleberry (*Rubus nutkanus* Moc.); *Macrosiphum chrysanthemi* Oestl., on the young shoots of a composite; *Macrosiphum granarium* Kalt., on various grasses in spring; *Macrosiphum solanifolii* Ashm., on wild lettuce.

MEANS OF PREVENTION AND CONTROL

80 - The Vine Moth Caterpillar Parasite (1).

FRENCH, C. in: *The Journal of the Department of Agriculture of Victoria*, Vol. X, Part 9, p. 552 + 1 plate. Melbourne, September 1912.

During the period from January to April, 1912, many shrivelled-up and dark-coloured Vine Moth caterpillars were noticed on vine leaves, in Victoria, Australia. On investigating the matter, the writer noticed that a parasite had been at work and all the live caterpillars had clusters of larvae on their backs.

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(1) The Vine Moth is *Agarista glycine* Lewin. See: FRENCH, *Handbook of the Destructive Insects of Victoria*, Part II, pp. 101-107. Melbourne, 1893. (*Ed.*)

When the eggs of the parasite (a chalcid fly) are first deposited on the caterpillars, they are exceedingly small, but soon develop. The larvae grow fairly rapidly, and spread all over the backs of the caterpillars. The time occupied from the eggs being deposited until the larvae are fully grown, is about a week. About the second day after the larvae are hatched, the caterpillars cease eating, and remain in one place, and at the end of the week they are simply sucked dry by the parasite. When the caterpillars are dried up, the parasites cover them with a silken covering, and form their cocoons, emerging as perfect insects in a couple of weeks' time.

When the perfect Hymenopterous insects were hatched out in the observation box, live caterpillars of the Emperor Gum Moth (*Antherea eucalypti* Scott) and several species of Cutworm Moth larvae (*Mamestra ewingi* and *Agrotis* sp.) were placed in the box, but the parasite did not deposit eggs on them.

These parasites are reported to be doing good work this season in many parts of Victoria, and it is hoped that they will keep the Vine Moth in check.

81 - The Life History and Habits of *Cheyletus seminivorus* Packard.

EWING, H. E. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 416-420. Concord, N. H., October 1912.

Cheyletus seminivorus Packard was first found in stored cabbage seed; the species, however, is not an enemy to seeds or to stored grains, for it is entirely carnivorous. When this acarid is found among seeds or in stored grain it is here only to prey upon some other species, which is the real pest.

During the winter 1911-1912 the writer came into possession of a sample of milled wheat which was badly infested by Tyroglyphid mites. Associated with these were found at first only a few individuals of *Cheyletus seminivorus* Pack. Some of these were selected to be used in a series of experiences upon the life history and habits of this species, and the results so obtained are here detailed. A few days after, the same sample was examined and it was found that out of 100 Tyroglyphids counted, 96 had been sucked by the *Cheyletus* and were dead, and only 4 were alive and active. Thus in a short period of only a few days this predaceous species had multiplied and destroyed about 95 per cent. of the pernicious Tyroglyphids.

82 - Lime-Sulphur Wash an Inefficient Ovicide for Codling Moth.

SAFRO, V. I. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 385-395. Concord, N. H., October 1912.

Reports have occasionally been published showing a decrease in codling moth infestation following applications of a lime-sulphur wash. Until within the past few years a coating of lime-sulphur upon insect eggs has generally been considered fatal. Only recently have experiments shown a surprising lack of insecticidal power in spraying aphid and red spider eggs with lime-sulphur mixtures.

The paper under review is a report of a preliminary series of experiments conducted during the fall of 1911, in order to obtain data on the possible efficiency of lime-sulphur in killing the eggs of the codling moth. From an infested orchard, more than two hundred apples were collected upon which codling moth eggs had been deposited. These were examined and only the apparently healthy eggs were used in the experiment, which was carried on in a laboratory. At first an attempt was made to spray the apples by means of an atomiser. This method was given up as a failure because the spray collected in drops covering only a small portion of the surface of the apple, in which case the egg was more frequently missed than hit. When the drops of spray were too large they would roll from the apple leaving a practically dry surface. The same would frequently occur on shaking the fruit. This was the first indication of the inefficiency of a lime-sulphur spray for killing codling moth eggs. The failure of a spray to cover the eggs deposited on the fruit is sufficient to exclude it as an ovicide, regardless of its efficiency in the laboratory.

The method finally adopted was to place a drop of the spray material directly upon the eggs. These were divided into four lots : 1) untreated ; 2) treated with a one-to-30 dilution of lime-sulphur testing 30° B (1) ; 3) treated with lime-sulphur one-to-30 with arsenate of lead added at the rate of four pounds to 100 gals. of the diluted spray ; 4) treated with a 5 % solution of calcium polysulphides containing a slight amount of CaS_2O_3. The eggs were treated on the day collected.

The detailed results are tabulated. They may be summarised as follows : 1) 90 of 93 eggs hatched ; 2) 85 of 100 eggs hatched ; 3) 16 of 23 eggs hatched ; 4) 8 of 28 eggs hatched. " With these results, then, it is evident that lime-sulphur, even too strong for use on foliage and fruit, is at best an uncertain ovicide, and its effectiveness is of doubtful value economically. "

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(1) This method of specification of the « strength » of lime-sulphur, so often encountered in the literature, is uncertain, because a specific gravity determination of a lime-sulphur solution is really a reading of two (at least) solutions of unknown densities, present in unknown proportions and of different degrees of chemical activity. These two solutions are the calcium polysulphides ($Ca\ S_4$ and $Ca\ S_5$) and the calcium thiosulphate (CaS_2O_3). The polysuplhides are by far the most active chemically and undoubtedly the most important insecticidal ingredient in lime-sulphur.

The nearest approach, at present, to a logical determination of the « strength » of lime-sulphur is a statement of the amounts present of calcium polysulphide and calcium thiosulphate. The writer used a 5 % solutiom of calcium polysulphide as a more certain test in addition to « a one-to-30 dilution of lime-sulphur, testing 30° B. ».

(*The Author*).

83 - Campaign against *Agrotis ypsilon* in India (1).

A Communication from the Director of Agriculture, Behar and Orissa, to the International Institute of Agriculture.

In the Entomological Section of the Agricultural College at Sabour the most important work during September and October 1912 was the campaign against *Agrotis ypsilon*. When the land was under water, the traps were set up on high lands near villages, and with the receding of the flood water they have been moved down lower and arranged according to our scheme of work. During the last two months, up to the end of October, 68 000 moths have been captured, which would, in the ordinary course of things, have given rise to 10 millions of caterpillars. Some first attacked areas have been picked off, and the number of caterpillars destroyed is 53 000. Owing to the abnormal weather conditions prevailing in the Province, the crop on the land is not as satisfactory as it should be. The campaign work is getting on satisfactorily. The effect of the work will be evident in another month's time.

The potato-storing demonstrations have been wound up, as the season is over. A report on this work will be published later.

INSECTS INJURIOUS TO VARIOUS CROPS

84 - Insects injurious to Rice in the Philippines. — See above, No. 271

85 - Moth Borer in Castor Oil.

The Rhodesia Agricultural Journal, Vol. X, No. 1, pp. 102-104. Salisbury, October, 1912.

Experimental plantings of castor oil in the Transvaal and Rhodesia have shown that the insect factor is one of the more serious handicaps to success. This view has been amply supported by the results of a small planting made in the spring of 1909 at the Experimental Station, Salisbury. By the 1911-1912 season practically every plant of the original planting was infested by *Duomites capensis*. It should be noted, that plants which had grown from dropped seeds germinating in the spring of 1910 had not yet been attacked.

Several species of insects have been observed to damage the castor oil in Rhodesia, but by far the most harmful is the Moth Borer (*Duomites capensis*), which bores the stems and branches. The eggs are laid in masses on the stem of the plants near the ground level and are yellowish in colour, smooth-surfaced and shiny. The method by which the young larvae obtain entrance to the stem has not been observed, but it is possible that they make their first few meals inside the leaf buds and penetrate thence into the stems. The exit holes of the moths are nearly always on the lower part of the stem or branches and the first damage is usually on the lower part of the stem.

The full-grown larva measures rather over 2 ½ inches in length; it is thick and fleshy with prominent segments. The period of the larval stage has not been accurately determined, but in this family (*Zeuzeridae*) this period is sometimes prolonged over more than a year. This species does not produce only one well-defined brood in the year, as half-grown larvae and full-fed larvae and pupae have been found in the same plant at the same time, and some adult moths have bred out in May and August, while the moths in the Transvaal have been recorded by Thomsen to have emerged in September and October.

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(1) See No. 1586, *B.* Nov. 1912. (*Ed.*).

The female pupa is nearly 1 ¾ inches in length and is a little larger than that of the male, which sometimes measures as little as 1 ¼ inches. The female moth is considerably larger than the male and is provided with a prominent ovipositor with which to insert its eggs into crevices in the plant. The attacks of these insects are frequently followed by those of " white ants ", which complete the work of destruction very thoroughly. Borers are amongst the most difficult of insects to attack, and several methods are suggested for their destruction; probably the measures which are used in England against the "Goat Moth" would be effective — a thick paste made of clay, lime and soft soap is smeared over the stems and branches to prevent egg deposition.

To destroy the borer in the stems, a small piece of cyanide is inserted into the hole and the latter is stopped with clay. A few cubic centimetres of carbon disulphide injected into the burrow and the hole plugged is a method also likely to be very effective.

When the borers are killed by one or other method, the holes should finally be stopped up with grafting-wax, or some other substance, to prevent the ingress of other insect-enemies and injurious fungi.

86 – *Leucoptera coffeella*, an Insect Parasitic on the Coffee Plant at Sao Paulo Brazil.

Thering, Rodolpho (von). Nossos cafezaes ameaçados de una praga que ja' arruinou os fazendeiros do Rio. — *Chacaras e Quintaes*, Vol. VI, No. 4, pp. 1-7. S. Paulo, Brazil, Oct. 15, 1912.

The coffee plant in Brazil is, at present, one of the least subject to pests; nevertheless, it did not enjoy this total immunity in the past.

Thus from 1880 to 1890 *Heterodera radicicola* infested the roots of the coffee plant in the State of Rio Janeiro to such an extent, that the crop in some cases was reduced by 95 per cent. The nematode afterwards disappeared suddenly. About the same time, there appeared in this State the "bicho do café" (the insect which the present article mentions as occurring in the State of Saõ Paulo); its ravages were estimated by Delacroix as affecting 35 per cent. of the crop, and by Van Delden Laerne as destroying the whole crop in some plantations. This dangerous parasite is a microlepidopter belonging to the family of the *Tineidae*, subfamily *Lyonetianae*.

It was observed for the first time in the Antilles by Perrotet and determined in 1848 by Guérin-Minerville, who named it *Elachista coffeella*. In 1861, Stainton placed it in the genus *Coniostoma*. Lord Walsingham

(*Proc. Zool. Society*, London, 1897, p. 141) recognized that this genus is identical with *Leucoptera*.

As the latter appellation had the priority, the writer gave the insect the name of *Leucoptera coffeella* Guérin. He mentions among related species, *L. scitella*, which does great injury in Europe to the leaves of apple, pear, etc.

The havoc is wrought by the larvae; these are scarcely visible to the naked eye, and they penetrate through the cuticle of the upper surface into the leaves and devour the parenchyma situated between the two layers of epidermis. The latter in the end separate from the parenchyma, becoming somewhat prominent, and assume a brown or reddish hue, hence the name of "rust" given to the disease in the Antilles and that of "iron spot" (*mancha de hierro*) by which it is known in Venezuela.

A single leaf can support several larvae (as many as 25 have been counted). The larvae remain in the leaf from 7 to 8 days, according to Perrotet (whose observations were made in the Antilles) and from 18 to 20 days, according to Pickmann Mann, who studied the larvae at Vassouras, in the State of Rio Janeiro. The discrepancy in the data is doubtless due to the differences of the localities and the climate.

The larvae escape from the leaf by making on the latter an aperture 1 mm. in size, most often upon the lower surface, where the cocoon is usually attached. The chrysalis period lasts barely 6 days (only one observation has been made on this subject). There are several generations in the year; these are most numerous in mild winters.

Leucoptera coffeella has a wide area of diffusion; in America, it is found in the Antilles, in Venezuela and in Brazil (where it was probably introduced from the Isle of Bourbon towards 1860); it also occurs, amongst other places, in Madagascar, Réunion and Mauritius.

Some observers believe that the insect is indigenous in Abyssinia, where it lives on the wild coffee plant.

It appears that *Coffea arabica* is alone attacked, *C. liberica* being immune. The amount of damage caused by this pest is very variable, being sometimes very slight, when a few leaves are a little injured; at other times much injury is done, and the plant is so much weakened by loss of sap that one-fifth of the flowers fall off.

The present limitation of the injuries is probably attributable to the action of the parasites of *L. coffeella*, viz. *Eulophus cemiostomatis*, *Exothecus letifer*, a species of *Apanteles*, and another, hitherto undetermined, species of *Eulophus*. The writer has succeeded in breeding a hyperparasitic chalcid.

Lamp traps are recommended as a means of control (for the moths are nocturnal); also the collection of all fallen leaves containing larvae, which should be burnt, or at once buried; another measure is the rearing of the natural parasites of the pest. This is effected in small breeding boxes provided with nets with meshes fine enough to prevent the escape of the parasite of the plant, while at the same time permitting the passage of the parasite of the insect. The writer adopted the latter method in the work he is carrying on.

In the appendix, there is a bibliography of 9 works.

87 - **The Occurrence of the Citrus Red Spider (*Tetranychus mytilaspidis* Riley) on Stone and Pomaceous Fruit Trees in Oregon.**

EWING, H. E. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 414-415. Concord, N. H., October 1912.

In November 1911, while examining some leaves and twigs of apple trees at Corvallis, Oregon, for the common red spider (*Tetranychus telarius* L.), the writer came across *Tetranychus mytilaspidis* Riley, the well-known red spider of citrus trees in Southern California. Since this observation several records have been made of this species in Oregon.

In the paper under review the writer submits notes on its biology and economy under the influences of its new host plants and new climatic conditions, and presents in tabular form the records of the species made in Oregon,

Here in the autumn eggs are deposited on the twigs. These eggs hatch in the following April and the larvae feed upon the tender leaf shoots. These mites continue to feed and reproduce from the time of hatching until the end of the rainy season, but with very little vitality. It is during July that the adults become very active and the eggs are found scattered about all over the leaves, the species becoming very injurious by sapping the juices from the leaves and causing the latter to become pale or spotted and to curl up around the edges.

As means of control summer sprays and, even better, some dormant spray to kill the eggs are advised.

Lime-sulphur is not a satisfactory winter spray for the eggs of this mite. It will not kill the embryos in the eggs at all, but will, however, kill some, and at times perhaps 60 or 70 per cent, of the larvae after they have emerged.

88 - ***Earias chlorana*, a Parasite of *Salix viminalis*** (1).

FEYTAUD, Y. Les Insectes de l'Osier: *Earias chlorana* Linn. — *Bulletin de la Société d'Etudes et de Vulgarisation de la Zoologie agricole*, Year II, No. 4, pp. 89-97 Bordeaux, 1912.

The osier is one of the most widely cultivated plants of south-west France, especially in the Gironde and Corréze.

Salix viminalis Linn. ("Osier blanc," the basketmakers' osier) is the most common species in the osier beds of this district, and seems to be the most liable to fungus diseases, and to the attacks of parasitic insects. After the month of August, a rust of the genus *Melampsora* attacks nearly all the leaves.

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(1) See No. 876, *B.* May 1912; No. 1702, *B.* Dec. 1912. (*Ed.*).

Amongst the insect enemies of the osier, the goat moth (*Cossus ligniperda* Fabr.) and *Sesia* sp., the Longicornia *Lamia textor* Linn., *Oberea oculata* Linn. and *Aromia moscata* Linn., and especially the beetle *Cryptorrhynchus lapathi*, Linn. make galleries in the underground stems; while the *Chrysomelina*, of which the writer has already made a careful study (*Bulletin de la Société de Zoologie agricole*, Bordeaux, 1908 and 1909), *Earias chlorana* Linn., *Sarrothripa revayana* S. V., and many other species destroy the portions above ground.

The two latter species devour the shoots, which leads to the suppression of the terminal buds, and causes the osiers to ramify and to become valueless to the basket maker.

The last-mentioned species is always much rarer than the first in the osier beds of south-west France. In this district, there are two generations of *Earias chlorana* annually. The first does havoc in May-June, the second in August-September and passes the winter in the chrysalis condition. The moths, which appear in May and in July, lay their eggs on the extremities of the osier shoots, one on each shoot.

The caterpillar makes a cigar-shaped sheath by rolling together the neighbouring leaves of the terminal bud. It leaves untouched its sheltering sheath, and only devours the inner leaves.

The writer counted more than 50 per cent. of infected shoots in some plantations. No remedial treatment can be practised with the view of affecting the ensheathed caterpillar; the best control method is the collection and destruction of the cigar-shaped sheaths. The use of insecticides or insectifuges is less recommended, since the hatching period of the eggs of a single generation may extend over more than a month, which, together with the rapid renewal of the terminal leaves, would render the application of these remedies very difficult.

To obtain any result, the treatment would have to be repeated every week or ten days during the laying season; this was in fact done by the writer, in his series of experiments. He states that he observed a sensible diminution of the damage after three applications of a simple cupric mixture, and more so when he used a cupro-phenic, or cupro-nicotine mixture. Better results were obtained by dipping the extremities of the shoots into the compound than by spraying them.

These treatments can only be carried ont in the spring, as the osier beds become too thick in August-September.

Cupric mixture sprayings are very efficacious, not only in the case of *Earias*, but also in that of *Chrysomelina*, and rusts. It is possible after having once cleared an osier bed of *Earias* by the repeated removal of the sheathed larvae, to guard against reinfection by the setting of lamps or baited traps.

A bibliography of 11 publications is appended.

INJURIOUS VERTEBRATES.

INJURIOUS VERTEBRATES

89 - Crows and Rooks in Agriculture.

JABLONOWSKY, J (Director of the Budapest Entomological Station) A Varjak a Mezogazdas ágban. — *Kisérletügyi Közlemenyek*, Vol. XV, No. 3, pp. 466-508. Budapest, July-Sept 1912.

This is a detailed study of the part played by crows and rooks in agriculture, according to publications printed in Hungary and elsewhere. The question is one of importance to practical agriculture everywhere where there are large numbers of rooks, and is one which affects the agriculturist, ornithologist and agricultural entomologist. Species of *Corvus*, especially the rook (*Corvus frugilegus* L.), have partisans who regard them as actual allies of agriculture, but their detractors aver that they are injurious. The writer belongs to neither side.

In an earlier publication (*Kisérletügyi Közlemenyek.*, Vol. IV, No 2, 1910) and elsewhere, he discussed the data obtained out of Hungary. The present work is a critical study of data collected in Hungary itself, and shows that the supposed utility of the rook was based on false biological views and one-sided statistics. The writer states that the examination of the stomachs of rooks and of other insectivorous birds (killed by thousands) do not furnish the expected proof of their utility, but show, on the contrary, that they have destroyed inoffensive birds. Taking these observations as a basis, M. Jablonowsky concludes that *C. frugilegus* L. should not be regarded as a wholly useful bird. In places where it builds its nests in large numbers, it is capable of causing considerable damage, which justifies its destruction. In comparison with the harm it does, its utility is very slight. Where it is only a bird of passage, this bird is for the most part inoffensive.

90 - Birds and Rats injurious to Rice in the Philippines. — See above, No. 27.

91 - The Cat Problem in Australia.

LE SOUEF, A. S. in *The Agricultural Gazette of New South Wales*, Vol. XXIII, Part 10, pp. 895-896. Sydney, Oct. 1912.

The domestic cat of Australia has become wild and must be included in the list of the destructive animals of that country.

The cats which have become wild, are in some cases animals which have been turned out into the bush by their owners, others have run away, or have been liberated by stock owners as a supposed enemy of the rabbit.

They have now become established throughout the land and are living on the wild game. They devour small animals, lizards, opossums, and even lambs, as well as rabbits. In the Macquarie Islands they were very numerous and destructive to the sea-birds, which supply the sealers with eggs. It was therefore necessary to introduce dogs for the suppression of the cats. When the latter were killed off, the dogs then attacked the seals, and therefore had, in their turn, to be destroyed. Where the wild cat has established itself, the ground game and small marsupials have greatly diminished, and it seems that in the future the partial extermination of certain species can be counted upon, while its influence on the rabbit question remains yet to be seen.

Wild cats have practically no enemies in Australia. They seem to be reverting to a specialized type, that of a blotched tabby; in parts of Queensland, they are more or less striped and have a heavy ruff round the neck. In Lord Howe Island, they are very dark, mottled grey, much larger than the average house cat, specimens up to 20 lbs. in weight having been recorded.

ALFREDO RUGGERI, *gerente responsabile.*

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of December 1912 and January 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

The Present Condition of Citrus Growing in Spain

by

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According to the latest official figures, which are fairly accurate, there are in Spain 117 459 acres under oranges and 6363 acres under lemons. Other citrus fruits are not grown to any extent, and probably 2500 acres would cover the area under limes and citrons; further, these are hardly ever grown alone, but are planted in small numbers among oranges and lemons.

The production of fruit in 1910 was 782 200 English tons of oranges and 623 250 tons of lemons.

THE CHIEF ORANGE-GROWING REGIONS OF SPAIN.

The principal orange-producing centres in Spain are the renowned adjoining provinces of Valencia and Castellôn, the province of Murcia and the province of Seville: these represent three distinct regions.

In the *first* region sweet oranges, particularly Valentian, Imperial, and Tangerines, are almost exclusively grown: these are in demand on the English market and for consumption in Madrid. There are many other varieties, in particular blood oranges, which are much in demand for Germany owing to their good keeping qualities.

Orange growing has long been carried on in this region along the coast and in the lower valleys of the rivers, where frosts are quite exceptional. It has now extended up the lower slopes and first plateaus of the neighbouring mountains, but the crop is here not quite certain. The soil in the orange groves on the low ground is clayey in Castellón and lighter in Valencia, but always deep; out of the valleys the cultivable soil is poor and can only support oranges when carefully improved. This region also includes the groves in the provinces of Tarragona and Alicante, which adjoin it on the north and south respectively. Most of the oranges exported and consumed in the centre and north of Spain are grown in this region. Of the 120 000 acres in Spain, nearly 100 000 belong here, and of these some 850 000 are in the two provinces of Valencia and Castellón. The chief centres of production are Alcira and Carcagente in the wide valley of the Jucar, and Burriana and Villareal in the Mijares valley. The sub-region of the Balearic islands may be put with this region, but its production is declining and of little importance.

The density and even distribution of the population and the careful work of the men who attend to the trees and gather the crop are factors no less favourable than the climate to the good results of orange-growing.

The principal orange-groves in the *province of Murcia* are about Murcia itself and in the lower valleys of the Segura and the Vinalopó. The meteorological conditions are much the same as in the first region. The soils of the Murcia and Segura valleys are mostly more siliceous, and are very well suited for lemons, largely grown in this region, and limes. These two crops, which cover nearly as large an area as the various varieties of oranges, give sweet and exquisite fruit, which does not keep very well.

The distance from the ports has been the chief reason why these crops have not developed as well as in the Valencia region.

The eastern provinces of Andalusia may be included in this second region, with which indeed they are already connected geographically. Almeria and Malaga each grow some 1750 or 2000 acres and Granada about half this area. The valley of the Almanzora and the maritime and central parts of Granada and Malaga are the only areas in which this cultivation leaves the coast and extends to the sheltered slopes of the sierra of the Alpujarra. The soils are formed of transported material and are very fertile owing to the weathering and transportation of the parent Silurian slates.

The commonest varieties are the Chinese orange, the Malta blood-orange, the Grano de oro and Tangerines; the fruit is sweet and of good quality. Bitter oranges are also grown in Malaga and limes in Granada and Almeria.

A good number of cases of oranges are exported to England from this region. The home market takes the lemons and limes at good prices.

Near the limits of this zone, especially in Granada, orange growing is somewhat neglected, so that the trees often suffer from gummosis. As the dead trees are not replaced, the yield is diminishing; it was, however, never more than sufficient for local needs.

The *third* comparatively important region is that of *Western Andalusia*, whose centre is the province of Seville with over 3500 acres of groves. Here the climate is less favourable, owing to the cold winters which are general. The chief districts are Seville, Mairena, Carmona and Dos Hermanas. By the valley of the Guadalquivir this important region communicates with the sub-region of Cordova, where it reaches its northern limit on the sheltered slopes of the cordillera of the Morena.

With this region are also connected the groves in the provinces of Cadiz and Huelva, all on deep and fertile alluvium. The development attained by oranges in this region is generally greater than in Valencia. Bitter oranges do best, as their flowers can stand cold; on and near the coast limes do pretty well, and those from Conil are celebrated. Many other varieties, both red and yellow fleshed, grow in the gardens and groves beside the ones mentioned.

The cultivation is lucrative here, for the production is somewhat above the consumption and leaves room for export. The oranges picked in autumn are sent away, while those that hang all through the winter and get more or less damaged by frost are sold locally at prices up to 10*s.* per cwt. ($2.20 per 100 lbs.).

Lack of care, particularly as to manuring and pruning, has led to the trees becoming infested with all the diseases which have recently appeared.

In some of the remaining provinces, such as Barcelona in the north-east, Badajoz and Cáceres in the south-west and Pontevedra and Corunna in the north-west, oranges are grown on a small scale in sheltered places or close to the sea.

The cultivation of citrus trees is not everywhere equally careful. In this respect the east coast (Valencia) region may be taken as a model. The working of the ground is generally satisfactory, except that trenching is not usually carried out before starting a grove: this is due to lack of an economical implement for the purpose.

Manuring is copious, but the formulæ used are not always sound. Irrigation leaves nothing to be desired, as in this region it has long been practised.

In this region the picking begins in early November for Imperials and Tangerines. Some fruits are picked first rather green to relieve the tree and encourage the ripening of the rest; a second picking is carried out in January and February, and the late fruits are picked dead ripe up to April. In the province of Valencia there is also a small second crop towards the end of summer — the result of a late and more or less irregular second flowering.

In the Andalusian region the cultivation is much less careful: the manure is almost always insufficient, and the neglect of pruning is shown by the tangled crowns of the trees. For this reason the trees have suffered badly from diseases.

The list of pests which infest all our orange-groves with greater or less intensity is large; the following are the most important: *Chrysomphalus dictyospermi* Mask.("piojo rojo"), *Mytilaspis citricola* Pack ("serpeta"), *Dactylopius citri* Risso ("cochinilla algodonosa"), and *Aspidiotus hederae* Vallot ("piojo" or "cochinilla blancos").

The first of these is the most important, owing to its prevalence and the damage it does; the agricultural associations and Governement inspectors have organized a campaign against this scale: this campaign began to be effective as soon as hydrocyanic acid fumigation was taken up and the worst attacked provinces were provided with the necessary staff and appliances for the work. The Committee of "ingenieros agronomos" to whom the work was entrusted has now 32 tents and an efficient staff of trained men.

Economics of Orange Growing.

The figures given above for the area and yield of citrus fruits in Spain, which show what great importance these crops now have for the country, have been reached in a short period, for in 1870 the production was only one-third of what it is at present.

The upward movement, which was due to the demand on the English market and the extraordinary development of sea-transport, kept on increasing in the last decades of last century. In the east coast region, particularly in Valencia and Castellón, the groves increased very rapidly. In Alcira, Játiba, Carcagente, Villareal, Almanzora, Burriana and many other districts they increased four- or five-fold in a few years. Very poor land was brought under cultivation at considerable expense for improvements, including drainage or irrigation. This great extension slowed down considerably towards the close of the century, owing partly to economic conditions becoming less and less favourable to this superabundant production.

The accompanying table gives the figures for exports for the decade 1901-1910.

Year	Quantity exported		Value of exports	
	Oranges	Lemons	Oranges	Lemons
	tons	tons	£*	£*
1901	280 831	3 354	1 698 438	40 571
1902	362 569	3 189	2 197 617	38 571
1903	389 324	3 017	2 354 593	36 458
1904	402 569	4 040	3 353 571	48 863
1905	308 655	2 437	1 866 706	29 474
1906 . . .	386 505	2 072	2 337 541	25 058
1907	461 886	2 814	2 793 438	34 040
1908	458 876	4 088	3 172 090	49 449
1909 . . .	453 888	3 084	2 147 673	37 295
1910	489 354	3 188	2 367 652	38 562

* Calculated at 25.20 pesetas to £ 1.

There has been an increase all along, except for irregularities due to variation in the crop. So far no serious difficulty in disposing of the produce has been experienced.

The value of the exports seems to have changed very little during the decade. If the customs figures are to be credited, there was no great deviation from the mean price (5*s.* 6*d.* to 6*s.* per cwt., or $1.22 to 1.30 per 100 lbs.) except in the years 1904 and 1908, when it was exceeded, and 1909 and 1910, when the price was as low as 4*s.* 10*d.* per cwt. ($1.05 per 100 lbs.). From the above figures the changes in price are not very clear, but considering that other reliable figures (1) for 1902 fix the price of oranges at 4*s.* 10½*d.*, it may be taken that the change has not been unfavourable to the production, considering that in the last few years the lowering of price has been compensated by the rise in the value of Spanish currency on exchange.

Can these prices be considered paying for the grower?

Sr. Senz Bremon, in his work " Riqueza agricola de la provincia de Valencia," calculates the average yield of an orange grove in full bearing at 176 lbs. per tree and 18 000 lbs. per acre. The annual expenses, including interest on capital and the writing off of the expenses incurred before the trees come into bearing, amount to £15 ($73) per acre. Taking the fruit fallen and consumed at home as one quarter, and reckoning it at 1*s.* 7*d.* per cwt. (35 cents per 100 lbs.), and accepting the figures given by the Commission on inland customs duties, the annual production per acre may be taken as follows:

13 500 lbs. of oranges at 4*s.* 10½*d.* per cwt. ($1.06 per 100 lbs.) .	£29 7*s* 6*d* ($143.10)
4 500 lbs. of oranges at 1*s.* 7*d.* per cwt. (35c. per 100 lbs.) . . .	£ 3 3*s* 8*d* ($ 15.75)
Total . . .	£32 11*s* 2*d* ($158.85)

There is thus a net gain of about £17 10*s.* ($86) per acre, quite a satisfactory result. In the other orange-producing provinces the conditions are generally no less favourable. While there is no other region in which the production is so considerable (the average for the whole of Spain being not above 13 500 lbs. per acre) or so valuable, yet elsewhere the cost of production is generally less owing to the lower value of the land and the cheaper labour, as in the Andulusian provinces.

The condition of citrus growing would be better if both the yield and the means of disposing of it were always in a normal state. But owing to complex circumstances, this desirable situation is frequently not attained. At numerous places in the east coast region, particularly in the province of Castellón, the groves have been established on unsuitable soil, necessitating heavy expense for its improvement. To obtain water, for instance, wells had to be bored through rocky beds. In such cases the costs of forming the grove entail a much heavier charge on the annual expenses, and the yield generally does not equal that of the valley groves.

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(1) See: *Actas y trabajos de la Comision extraparlamentaria de consumos,* "Estado 45".
(Author's note).

In many places, certain factors of more or less constant and general action, such as the steady rise in rents of land and the new diseases, have an unfavourable influence on the economics of production. Again, while so far the disposal of the produce has always been possible, yet it is less easy than formerly, and the characteristic difficulties of over-production are beginning to be felt.

The commercial organization, with its sales ill-regulated, its forwardings badly distributed and poorly graded, and the frauds of its monopolizers, tends to depreciate the produce and combines with the already existing causes to produce a distinct state of uneasiness, which is considered by some as a veritable crisis in Valencian citrus growing.

It should be remarked that in the other orange-growing districts the conditions of the market continue to be highly favourable; indeed, in the east coast region itself, Murcia and Alicante continue to increase the number of their plantations and the size of their export figures, and the growers make no such complaints as do those in Valencia and Castellón. It is evident that the over-production is confined to these two provinces.

My idea is that the facts just mentioned give evidence of a marked, but not irremediable, crisis. The farmers' association is developing rapidly in the most affected provinces, and the organization of sales and exportation will easily be accomplished by the cooperative societies now in progress of formation, and the Government seems inclined to encourage the movement. The control of orange pests is already efficacious, thanks to the generalization of the hydrocyanic acid method. If these improvements can be further added to by measures for putting an end to the disorder of the new and generally badly situated plantations, orange growing in Spain will recover its former prosperity. Further, the development of the utilization of the secondary products (orange flowers, citric acid, bark), still in its infancy, will furnish a new source of profit, which the associations will find it easy to exploit.

It is evident that for this crop, as for all others, the future is uncertain, and a constant watch must be kept on competition so as to see how best to override it. For many years Spain has had to compete with other European countries. In other parts of the world thousands of acres of oranges and other citrus trees are being planted every year. This future competition (to which indeed all other European crops are subject) must be provided against by perfecting methods, continually adapting them to local requirements and turning out the type of fruit liked by the consumers.

Calf Rearing on the Emulsion System, with Coconut Butter as Cream Substitute.

by

Dr. Paul Schuppli

Director of the School of Alpine Economy at Grabnerhof, Styria, Austria.

With the rising prices of milk and the better methods of turning the milk supplies to account, it is natural that an attempt should be made by calf-rearers to discover effectual substitutes for this substance. Many, indeed most, of these substitutes have proved useless and do not replace milk in at all a satisfactory manner. Although a certain measure of success can be obtained by giving a calf milk only for a short time after its birth, and rearing it subsequently with the assistance of every possible feed, provided the greatest care and a certain amount of money is expended; yet the results are not wholly as satisfactory as if the young animal had been supplied for a longer time with milk, even if skim milk is gradually substituted for whole milk. According to this method, a heifer calf would be given milk for about 5 months, *viz.* whole milk for 2 months, this being gradually replaced by skim milk during 2 months, and skim milk being fed alone for the last month. In the case of a bull calf, milk is given for 8 months: whole milk for 2½ months, a mixture of whole milk and skim milk for 4 months and skim milk alone for 1½ month. The guiding principle is never to give the calf a large quantity of milk, but to give it over a considerable period. The expense entailed is not great and the result far more satisfactory than if a large quantity is given at first and soon discontinued. The result of the last-mentioned system is to produce a fat animal at first, *i. e.* one that has a large amount of reserve substances, which are of little use to a calf. On the contrary, if the over-feeding is continued throughout most of the rearing period, the result is a direct decrease in the milk yield. When the milk rations cease and the calf is fed on non-fatty substances, it loses the fat it put on when fed on milk and becomes pot-bellied (*Heu-bauch*). The aim of the breeder in rational feeding is to supply the young beast with such food as will enable it to use all its energy for the purpose of its perfect development; or in other words, the growing power of an animal must be continually brought into play by means of its food, so that its growth gets no check.

In 1905, at the Dairy Congress in Paris, the writer became acquainted with the system in vogue inFrance of replacing milk fat by another animal fat in calf-rearing and fattening. Encouraged by the success of the method, he made experiments in the same direction. In order to ensure satisfactory results and to obtain as much difference in cost as possible between milk fat and its substitute, he selected for the latter a vegetable fat, namely that obtained from coconut; this fat has also been used for cooking purposes as a butter substitute. The cheapest fats are those obtained from plants. Coconut fat also contains 99 per cent. pure fat, which is not usually the case with other similar substances; adulteration is so far out of the question, as no cheaper raw substances can be found. By mixing 35 grams in about 1 litre of skim milk, a milk with 3½ per cent. of fat was obtained, *i. e.* one corresponding to the average milk used in rearing, for it is of no special advantage to give calves milk which is extra rich in fat.

In order to make a suitable mixture, the fat and skim milk are heated to 60° C. and passed through an emulsion drum. Emulsion machines of this kind are supplied by the firm of E. Bazzi and Co. (Engineers) of 4 Viale Venezia, Milan, Italy, and Messrs. R. A Lister and Co., Dursley, England. The object of both these machines is to obtain a mixture of skim milk and of melted plant fat suitable for feeding; the mixture must not be allowed to stand, but should be made fresh each time, as the fat rises like that of whole milk, and thus each calf does not receive the necessary proportion of fat and skim milk. It is not possible to mix the plant fat and skim milk with a hand apparatus, and all attempts which have been made to do this have proved unsuccessful. It has been shown by experience that the use of so-called emulsion-milk is apt, under certain circumstances, to cause scour; but this can be largely be avoided by pasteurizing the skim milk.

The feeding is done according to the accompanying tables (pp. 169 and 170).

These tables are taken from "Leitfaden der Wartung und Plege des Milchviehes" by Dr. Paul Schuppli, published by Messrs. Parey, Berlin.

The calves are usually fed three times a day for the first few days. After a week, this is gradually reduced to twice, so that the daily amount given in the tables is fed in two portions, early in the morning and in the evening. It should be mentioned that the calves are given hay when they are a week old, but no water till the daily ration of emulsion and skim milk begins to decrease, and then 1¼quart of water is substituted for every quart of milk which is withheld; it is however always given after the dry food, instead of before, as was the case with the emulsion milk. When the calf is 8 weeks old, it is given oats and wheat bran; the ration for the heifer calf is 1 lb. each of oats and wheat bran, until the milk is withheld altogether; while for bull calves, the amount is 3 lbs. of the two together. Towards the end of the first year, this ration is gradually lessened and finally ceases in the case of the heifer calf, but the bull calf is given oats and bran for over a year. The best food for the heifer calf is not one which influences milk production, for it is only the first stage of development which should be taken into consideration.

TABLE I.

Bull Calf.

No. of days	Quarts *) per day				Total amount (gallons)			
	Milk from its dam	Whole milk	Emulsion milk	Skim milk	Milk from its dam	Whole milk	Emulsion milk	Skim milk
10	6	—	—	—	13¼	—	—	—
7	—	7	—	—	—	10¾	—	—
2	—	7	1	—	—	3	½	—
2	—	6	2	—	—	2¾	1	—
2	—	5	3	—	—	2¼	1¼	—
2	—	4	4	—	—	1¾	1¾	—
2	—	3	5	—	—	1¼	2¼	—
2	—	2	6	—	—	1	2¾	—
2	—	1	7	—	—	½	3	—
14	—	—	9	—	—	—	27¾	—
28	—	—	10	—	—	—	61½	—
35	—	—	8	2	—	—	61½	15½
14	—	—	7	3	—	—	21½	9¼
14	—	—	5	4	—	—	15½	12¼
14	—	—	3	5		—	9¼	15½
14	—	—	2	6	—	—	6¼	18½
14	—	—	—	8	—	—	—	24½
21	—	-	—	6	—	—	—	27¾
21	—	—	—	4	—	—	—	18½
220				Total . . .	13¼	23	215½	141¾

*) In this part of the table the litre is taken as equal to the quart, so as to avoid fractions; to obtain the exact amounts given by the author, subtract one-eighth from the figures: thus 10 quarts becomes 8¾, and 8 becomes 7.

The following table gives the results which have so far been obtained with calves reared on emulsion milk at the Grabnerhof School of Alpine Economy from 1905 to September 1912.

	Number —	Average increase per calf per day lbs.
Murboden heifer calves	90	1.63
Murboden bull and steer calves	78	2.05
Pinzgau heifer claves	44	1.70
Pinzgau bull and steer calves	46	1.91
Total number of calves	258	1.82

TABLE II.

Heifer Calf.

No. of Days	Quarts*) per day				Total amount (gallons)			
	Milk from its dam	Whole milk	Emulsion milk	Skim milk	Milk from its dam	Whole milk	Emulsion milk	Skim milk
10	5	—	—	—	11	—	—	—
7	—	6	—	—	—	9¼	—	—
2	—	6	1	—	—	2¾	½	—
2	—	5	2	—	—	2¼	1	—
2	—	4	3	—	—	1¾	1¼	—
2	—	3	4	—	—	1¼	1¾	—
2	—	2	5	—	—	1	2¼	—
2	—	2	6	—	—	1	2¾	—
2	—	1	7	—	—	½	3	—
14	—	—	8	—	—	—	24½	—
14	—	—	6	2	—	—	18½	6¼
14	—	—	5	3	—	—	15½	9¼
14	—	—	3	5	—	—	9¼	15½
14	—	—	2	6	—	—	6¼	18½
14	—	—	—	8	—	—	—	24½
14	—	—	—	6	—	—	—	18½
14	—	—	—	4	—	—	—	12¼
7	—	—	—	2	—	—	—	3
150				Total . . .	11	19½	86¼	108

*) See note under preceding table.

They were, as is seen, relatively satisfactory: not much more can be required for producing cows of good performance which are healthy and possess good powers of resistance.

Stress should be laid on the fact, that a hardening system was carried out simultaneously with the prescribed method of rearing. Consequently, the growth of the animals was less in proportion than if they had been stable-reared, but the often greatly increased growth which sometimes occurred in spite of similar feeding is thus explained. When they are a fortnight old, the calves are taken every day in winter to the exercising ground, which has a sunny aspect but no special shelter; in summer, they are turned into a pasture, where they at once begin accustoming themselves to a grass diet. Of course, they are still fed in the shed as before and the same amount of bulky food is given till they are able to obtain sufficient grass, when of their own accord they refuse the corresponding amount of dry fodder. In this way, the grazing period is got over without scouring or much loss of weight. The only precaution that is taken in bad weather consists in rubbing down the very young calves with straw as soon as they return to the shed, to prevent chill.

The chief advantage in emulsion feeding is that the same results are obtained as with a mixture of whole and skim milk and at far less cost.

Of this the figures in Table IV (next page) give the best proof.

Remarks on Table IV.

1) The price of whole milk is taken at 18 heller per litre (8¼ *d*. per gallon) on account of the general rise in the price of milk.

2) The cost of preparing 25 gallons of emulsion milk is reckoned as follows:

	s	*d*
24½ gallons of skim milk at 2¼*d*.	4	7
(the 2 quarts lacking are made up by the coconut fat, of which 8¾ lbs. will make the total up to 25 gallons).		
8¾ lbs. of coconut fat at 6¼*d*. per lb. (including carriage and preparation) . .	4	6¾
Cost of preparing 25 gallons of emulsion milk (including depreciation on machine)		3
Cost of 25 gallons of emulsion milk	9	4¾

Therefore one gallon will cost 4½*d*

3) A fifteen years' average at the Grabnerhof School of Alpine Economy gave 207 stall-feeding days and 158 grazing days. The costs of the stall-feeding and grazing days for heifer and bull calves are based on the experience obtained there.

4) The straw requirement is small, owing to the shortness of the stalls and the depth of the drainage gutter: the amount allowed is enough for calves up to a year old.

5) A man who milks 16 cows receives:

	£	*s*	*d*
Wages: per month 26*s*. 8*d*., or per year	16	0	0
Board and lodging: per month 23*s*. 4*d*.; per year	14	0	0
Total . . .	30	0	0
The attention for one cow therefore comes to	1	17	6
Reckoning one-third for a calf		12	6

6) The cost of stabling for one cow (including food rooms, manure pit

	£	*s*	*d*
and water troughs) comes to about	33	6	8
With interest at 4 % and upkeep at 2 %, the cost per cow per year will be . .	2	0	0
Reckoning one-third for a calf		13	4
7) Light and veterinary expenses are reckoned for a cow at		5	0
For a calf		1	8

8) The management of breeding must certainly be included in the cost of rearing, on the assumption that every breeder will incur certain expenses for the useful purposes of performance tests and selection of stock, and will also pay a subscription to his Association.

9) The value of the dung is estimated according to the amount produced, and it is assumed that there is a suitable pit for storing it.

In these rearing expenses the value of the calf is not included, as this depends on its breed, descent, etc., and is therefore very variable, as is

TABLE IV.

Substance	Unit price	For a Heifer Calf				For a Bull Calf			
		Reared on whole milk, and some skim milk		Reared on whole milk, emulsion milk, and skim milk		Reared on whole milk, and some skim milk		Reared on whole milk, emulsion milk and skim milk	
		Quantity		Quantity		Quantity		Quantity	
	s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
Whole milk	1 gallon — 8 ¼	166 gall.	5 13 5	30 gall.	1 0 8½	333 gall.	11 6 9½	36 gall.	1 4 9
Emulsion milk . . .	1 gallon — 4 ½	—	—	72 gall.	1 7 5	—	—	215 gall.	4 1 8
Skim milk	1 gallon — 2 ¼	80 gall.	— 15 2	108 gall.	1 0 5	149 gall.	1 8 0	141 gall.	1 6 10
Oats	1 cwt. 8 6	220 lbs.	— 16 8	220 lbs.	— 16 8	264 lbs.	1 0 0	264 lbs.	1 0 0
Wheat bran	1 cwt. 5 1	220 lbs.	— 10 0	220 lbs.	— 10 0	264 lbs.	— 12 0	264 lbs.	— 12 0
Salt	1 cwt. 5 11	2 ¼ lbs.	— — 1½	2 ¼ lbs.	— — 1½	2 ¼ lbs.	— — 1½	2 ¼ lbs.	— — 1½
Stall-feeding days . .	1 day { bull — 2 heifer — 2 ¼	207 days	1 14 6	207 days	1 14 6	207 days	1 18 0	207 days	1 18 0
Grazing days	1 day { bull — 1 ½ heifer — 1 ¼	158 days	— 15 9½	158 days	— 15 9½	158 days	— 18 5	158 days	— 18
Straw	—	—	— 4 2	—	— 4 2	—	— 4 2	—	— 4 2
Attendance	—	—	— 12 6	—	— 12 6	—	— 12 6	—	— 12 6
Rent of shed	—	—	— 13 4	—	— 13 4	—	— 13 4	—	— 13 4
Light and vet. . . .	—	—	— 1 8	—	— 1 8	—	— 1 8	—	— 1 8
Breeding management	—	—	— 12 6	—	— 12 6	—	— 12 6	—	— 12 6
TOTAL . . .	—	—	12 9 10	—	9 9 9½	—	19 7 6	—	13 6 0
To subtract for dung .	—	—	1 9 2	—	1 9 2	—	1 13 4	—	1 13 4
Net expenses	—	—	11 0 8	—	8 0 7½	—	17 14 2	—	11 12 8

also the danger of loss. The expenses must be understood to refer to a calf that is safely reared.

The difference in cost between rearing calves on whole and skim milk compared with the expense of using emulsion milk as well as whole and skim milk is, as the above table shows:

For a heifer calf	£3
For a bull calf	£6 1s. 6d.

Thus the advantage is on the side of the emulsion-milk system, and as the saving is very considerable, the trouble and labour entailed in making the emulsion milk is fully repaid.

It still remains to be shown that the final weight of cows reared on this emulsion is not inferior to that of animals raised in the ordinary way. There was no difference in the final weight of five-year-old Murboden and Pinzgau cows reared according to these two systems at Grabnerhof. The weight of 19 Murboden cows in 1906 averaged 1302 lbs.; in 1911, 43 cows averaged 1346 lbs., and amongst the latter were 12 animals which had been reared on emulsion. Thus, in this case, the final weight had increased rather than the reverse.

The emulsion system is certainly troublesome and requires great exactitude, but as the foregoing statements have shown, it is remunerative and much to be recommended. This has been proved by eight years' experience at Grabnerhof, and is corroborated by the experience gained on other estates.

Measures adopted in Sweden to spread Book-keeping among Farmers

by

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Up to recent years, when the measures adopted in Sweden to promote book-keeping among farmers were discussed, the only one that could be mentioned was the instruction given in this subject in the higher and lower schools of agriculture. It is true that some associations of rural economy, among others that of the province of Malmöhus, had since 1880 published forms of book-keeping adapted to the requirements of small and medium farmers. But it was only with the introduction of prizes for small farms that book-keeping was more generally introduced. For the last twenty years, every year and in each province an examination is made of small properties (up to 30 acres) worked by their owners, and the most deserving are given rewards of which there are three classes.

It was established in 1902 by the Statutes regulating these rewards that " the farmer who for his farm has received a prize in money cannot be awarded a second prize for the same farm unless he submits to the Commission of prizes his notes drawn up according to the forms fixed upon by the Direction of Agriculture, and collected by him since the time at which the first prizes were distributed." Thanks to this method of obliging farmers who wish to compete for the State prizes for small farmers to keep their books, a well regulated system of book-keeping has penetrated very widely among the more advanced small farmers.

In the larger farms the Italian system of book-keeping by double entry is adopted almost without exception ; among medium sized farms it is also very frequent to find that book-keeping, at least by single entry, is practised ; but with the exception of the small farms that have taken prizes, the practice of book-keeping has spread only to a trifling extent among small farmers. Nevertheless of late years it has been observed that the interest in book-keeping has increased in a most satisfactory manner among Swedish farmers, and it may be added that the small and medium farmers have not been less keen than the others. For this fact there are several reasons. Thus, the ever increasing intensity of farming has caused the need of control to be more sensibly felt. The spread of Control Associations (at the beginning of 1912 Sweden possessed upwards of 700 associations for the control of dairies and in general also of pig rearing concerns) has contributed a good deal to a better understanding of the economic importance of agricultural book-keeping. Besides by *the law of* 1910, *which establishes taxation on capital and on income*, agricultural book-keeping has, to a certain extent, been rendered compulsory in Sweden, as, according to this law, the net income of the farm is the basis for taxation by the State, and as soon as the assessed value of an estate exceeds 25 000 crowns (£1357) the farmer must be prepared to confirm the correctness of his individual declaration by his well-kept books.

Owing to the prominence thus given to this question, the campaign to encourage book-keeping especially among small and medium farmers has been carried on with renewed energy. Among the measures lately adopted in order to extend the movement among practical farmers the following may be mentioned :

1. *The creation of agricultural book-keeping bureaus.* — In 1911 and 1912 bureaus of agricultural book-keeping have been established in several provinces by associations of rural economy and by other associations formed especially for the purpose. In order to explain the organization of these bureaus the following extracts are given from the Statutes of the agricultural book-keeping association of the province of Malmöhus, which has its seat at Malmö (at present this association, which numbers about 100 members possessing among them a total of 14 820 acres, is the most important) :

" The Association is organized as an economic association without personal liability, and a representative of the Society of rural economy of the province has a seat on its committee.

"The book-keeping bureau established by the Association has the following objects in view: keeping and closing complete farming accounts based on the reports or yearly journals sent by farmers; auditing accounts; making inventories; drawing up individual declarations; distributing forms for book-keeping; and compiling, from the material which it receives, reports of a certain importance for elucidating economic questions of general interest."

"As for the diffusion of book-keeping, this is divided into three principal categories: A, simple agricultural book-keeping; B, more extended book-keeping, with special accounts for the various branches of the farm; to which is added for C a detailed control of the returns of the various crops."

The subscription to be paid for the keeping of books is based on the time spent for each member, and the minimum fee for closing accounts is, for the three types of book-keeping above mentioned, 20, 40 and 60 crowns (£1 1s. 8*d*., £2 3*s*. 4*d*. and £3 5*s*.) respectively. The sum to be paid for keeping the books has varied up to the present from 0.50 to 2 crowns per hectare of field (2½*d*. to 10½*d*. per acre) according to the size of the farm and the more or less complete system of book-keeping.

This association works also in connection with the control associations; the assistants of the latter assist the farmers in keeping their current accounts, after which the control and closing operations are done at the bureaus.

2. *The appropriations granted by the State and the Associations of rural economy for the spread of the practice of book-keeping among small farmers.* — According to a resolution voted by Parliament in 1911 a sum of 15 000 crowns (£900) is granted every year for distribution among the small farmers, who apply to the book-keeping bureaus approved by the State and by the association of rural economy. This subsidy is paid to the bureaus to which the farmers have entrusted the closing of their accounts, and it amounts to 15 crowns (16*s*. 3½*d*.) during four years for each account closed in the course of the year, for farms not exceeding 185 acres of arable land; it is given on condition that the interested association of rural economy pays an equal sum.

3. *Special courses of book-keeping for farmers.* — Two years ago, on the initiative of the associations of rural economy and of some private persons, a great number of courses of book-keeping were organized throughout the country for the benefit of farmers. These courses, which last only a few days, have generally been well attended. Further, instruction in simple agricultural book-keeping is frequently a part of the programme of the complementary schools attached to the primary schools in the country.

An active campaign is thus being carried on in several ways throughout the country, with the object of spreading the practice of agricultural book-keeping, and it is to be hoped that, with time, this work will be rewarded by success.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

92 – **The Encouragement of Flax, Hemp and Olive Growing in France.**

Encouragements à la culture du Lin, de la Chanvre et de l'Olivier en France. — *Journal Officiel de la République Française*, Year XLIV, No 344, p 10576 Paris, December 18, 1912.

The law of April the 9th 1910 allots to cultivators of flax and hemp, from the commencement of the financial year of 1910 and for a period of six years, prizes to an annual amount (including expenses of verification and control) not exceeding 2 500 000 fr. (£100 000), and which will be allotted, within the limits of this sum, in proportion to the extent of the areas sown, the minimum extent being 20 acres, the sum at no time exceeding about £1 per acre (60 fr. per ha.). The amount of this prize is fixed for the financial year of 1912 at £1 per acre.

By a ministerial decree of December the 16th 1912, the amount of the prize for the cultivation of the olive allotted by the law of April the 13th 1910 (1) is fixed for the financial year of 1912 at 5*s*. 6*d*. per acre (17 fr. per ha.).

93 – **Regulations for Cattle Sales on a Large Scale in the La Villette Market, Paris.**

Reglementation des ventes en gros sur le marché aux bestiaux de la Villette. — *Journal Officiel de la République française*, Year XLIV, No 344, pp. 10575-10576 Paris, December 18, 1912.

By the decree of the 27th of June, 1912, a Commission was appointed at the Ministry of Agriculture for the purpose of considering the amendments to be introduced into the decree of the 22nd of January, 1878, regarding sales on a large scale in the Paris markets, in order to enable cattle to be purchased at first hand in the market of La Villette.

The members of the Commission were nominated by a decree of the 16th of December, 1912.

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(1) See No. 2666, *B*. Aug.-Sept.-Oct 1911 (*Ed.*).

94 - **Horticulture in the Hungarian Budget for 1913.** (Extract from the statement on the budget of the Royal Hungarian Ministry of Agriculture.).

Gartenbau, Obstbau und Baumzucht in dem Staatsvoranschlag für das Jahr 1913. — *Volkswirtschaftliche Mitteilungen aus Ungarn*, Zur Orientierung des Auslandes herausgegeben vom königl. ung. Handelsministerium, Year VII, Part X, pp. 1438-1444. Budapest, October 1912.

Under the head of personal expenses of class 26, chapter XX (horticulture) the following sums were allocated:

For 1912	£ 6 350
For 1913	£12 635
Increase for 1913	£ 6 285

Owing to the limited means at the disposal of agriculture for this purpose, the Minister of Agriculture has decided to rent fields near towns, industrial establishments and watering-places, for the growth of vegetables and flowers, and to give spare time employment to children who wish to improve in horticulture, instead of costly lectureships, which will in future only be established in a few important places.

At the same time, coloured photographs of plants, fruits, etc., will be prepared, for the instruction of the children during the winter by means of lantern projections. These practical meetings willl be continued for a year or two by the ordinary agricultural staff, till the schoolmasters or other State employés have qualified for the continuation instruction of the children.

Among temporary expenses, £1667 have been appropriated under the heading: "for publishing market prices of horticultural produce, and for the organization of sales of the same." This expenditure is amply justified by the state of the markets, which clearly show the lack of information concerning buying and selling.

To remedy this state of affairs in the future, an organization will be created under the Ministry of Agriculture, consisting of employés of this department, reporters and persons who have gained some State certificate in horticulture; by means of this, the trade will be able to have information on the market prices of the whole country, and the central station will have a sure foundation for the rational introduction and extension of certain branches of production, while preventing its happening that the demands made by foreign countries cannot be acceded to owing to lack of information as to the provenance of goods.

In connection with this question, the sale of the products must be seen to, especial care being taken that the small growers are not too much at the mercy of middlemen. Small growers must be able to sell their goods to reliable salesmen, and must be instructed in grading and packing. The realization of this double purpose is only attainable by material State assistance, for the necessery guarantees can only be obtained — until such time as commercial confidence in this organization is established — by payments in hard cash.

The Royal Hungarian Ministry of Agriculture wishes to assist this commercial enterprise by appointing packers, and by the grafting of fruit trees by State agents in cases where obstacles to the activity of the organization are formed by the lack of uniformity in the fruit trees. It also wishes to bear the expenses of organizing fruit markets where the grading and packing of the products purchased in advance are carried out at the grower's.

For starting and helping market-gardens, £833 were voted in 1913.

The organization of such market-gardens was taken up by many municipalities, communes and corporations.

At the same time, to obtain greater and more lasting results, it is necessary to support the production of the types of fruits whose market value is increasing, and for this purpose existing centres of production should be encouraged and fresh ones started.

With regard to the improvement of quality, which necessitates the creation of Experiment Stations, the State will undertake to bear considerable expense; it will also see to the formation of new central stations, for proprietors can only start on market gardening when there are examples to follow and success is plainly evident.

The State should therefore organize the whole production by starting undertakings cheaply, and arranging for their direction by competent State officials who will teach the people.

For starting and assisting establishments for horticultural seed improvement, the budget has allocated £833.

The production of agricultural seeds has been greatly encouraged by the company for the "production of Hungarian agricultural seeds," which also undertakes the growing of some vegetable seeds. The activity of this society, however, is directed only to exportation.

To do away with the disadvantages of getting the seed required at home from abroad, the first thing would be to set up small establishments for seed-growing on plots surrounded by small farms. The results obtained would be made known among the growers, who would then themselves take part in it.

The production of seed might be increased if the director of the chief trial station were to undertake the giving out of reliable information, and if the purchase of the seed grown were guaranteed in advance, as the best firms of seed merchants have declared they would be willing to do.

In spite of the favorable climatic conditions, which allow of rapid ripening, and the conditions of the soil, which encourage quick multiplication, the growing of hyacinths and tulips and other bulbs is still very limited; steps are being taken to increase this branch.

For 1912 £6000 were allotted, and for 1913 £22 500; the increase of £16 500 is destined for new buildings, greenhouses, etc., in the establishments.

95 - Growth and Usefulness of the Publication Work of the U. S. Department of Agriculture.

WILSON, JAMES (Secretary of Agriculture) in *Report of the Secretary of Agriculture*, 1912, pp. 115-117 and *passim*. Washington, 1912.

Secretary Wilson concludes his record of 16 years at the U. S. Department of Agriculture; this period began in 1897 with a yearly farm production worth $4 000 000 000 and ends with $9 532 000 000, and the crop produced in 1912 has been the greatest in the history of the United States.

Along with this increase, the number of persons employed by the department grew from 2 444 in 1897 to 13 858 on July 1, 1912, and the appropriations for the department increased from $3 272 902 for the fiscal year ending June 30, 1898, to $24 743 045, for 1913. Secretary Wilson states that in wealth produced and conserved during these 16 years the U. S. Department of Agriculture has returned more than ten times these appropriations; and that the publication work of the department is an unerring indication of its growth and usefulness.

Evidences of growth and usefulness. — The records of the Division of Publications, in which the publication work is centralized, show that in 1897 the mail requests for publications barely exceeded 500 letters per week, while during the past year, the weekly mail has exceeded 52 000 letters, or more than 100 letters for each one received at the earlier date.

With a printing fund of $116 888, the different publications printed in 1897 were 424, and the editions aggregated 6 541 210 copies; in 1912, with an appropriation of $470 000, the different publications were 2110, aggregating 34 678 557 copies.

The work of the Division of Publications reflects, and it is assumed must always represent, the activity of the other offices of the department. All the information acquired in the several bureaus by the means at their command finds its expression necessarily in the form of publications which pass through this office. Every enlargement of the scope of the work covered by any other office, especially the adoption of entirely new lines of work, involves an addition to the work of the Division of Publications.

The appropriations for the fiscal year 1897 disbursed by this division for salaries, supplies, etc., amounted to $44 367, while for 1912 they were $209 960, an increase of nearly 475 per cent. In 1897, the number of employees in the division was 61, and in 1912 aggregated 197, an increase of nearly 225 per cent.

Number of copies distributed. — During the 1897-1912 period over 225 000 000 copies of publications have been distributed to those engaged or interested in farming. Of this number slightly more than 88 000 000 copies were Farmers' Bulletins. Although the series of Farmers' Bulletins was begun in 1889, only about 5 000 000 copies had been issued by 1897, and those distributed during that year amounted to less than 2 000 000 copies, while during the year 1912 over 10 000 000 copies were distributed. Previous to the period under discussion only 41 different Farmers' Bulletins had been prepared, and at present there are 506 separate pamphlets discussing nearly every phase of modern agricultural operations.

It is stated that no other Government issues as many publications as does the United States, and that no executive department of the U. S. Government issues as many publications as does the U. S. Department of Agriculture in performing its function of acquiring and disseminating useful information in regard to agriculture. But the rapid increase in the population of the country and the great popularity acquired by the documents of the U. S. Department of Agriculture have so augmented the demand that the department has not in recent years had an appropriation that permitted the printing of a sufficient number of copies to meet the demand.

The U. S. Congress, however, has provided a solution of the problem by authorizing the Superintendent of public documents to reprint and sell at a nominal price such documents as may be required. The enormous increase in the sale, by that official, of the U. S. Department of Agriculture publications is surprising when it is remembered that millions of copies are distributed free, both by the Department of Agriculture and by Members of Congress. During the last fiscal year 171 866 copies were sold by the superintendent of public documents, for which he received $16 428.

The magnitude of the work of disseminating the vast fund of information so systematically sought and so scientifically verified is commensurate with the enormous advance made in the application of scientific knowledge to practical agriculture of the United States — a result to which the U. S. Department of Agriculture has contributed no small share. The improved conditions on farms, the increased yields of crops, the improved breeds of live stock, and the new varieties of fruits resulting from the labors of the U. S. Department of Agriculture as detailed and explained in its publications have added many millions to the wealth of the American Nation.

RURAL HYGIENE

96 - Yellow Fever and Mosquitos.

HOWLETT, F. M. in *The Agricultural Journal of India*, Vol. VII, Part IV, pp. 363-367. Calcutta-London, 1912.

India has so far been immune from yellow fever; but there is always the possibility of its introduction. The probability that the disease if once introduced would spread with any rapidity depends on the presence of certain mosquitos.

The organism which causes the fever is so minute that it has not yet been possible to isolate it, but it is known that the disease is propagated from a patient suffering from yellow fever to a healthy person by the bite of a mosquito known as *Stegomyia fasciata*. It is a "domestic" mosquito, and is generally found in or near human dwelling places, while it breeds in almost any small casual accumulation of water (such as sardine tins, broken pots, the cut ends of bamboos, etc.). Unfortunately it is not yet known whether the other species of the genus *Stegomyia* are harmless or whether they must be regarded as dangerous. Judging by analogy with the case of *Anopheles* mosquitos and malaria, it seems most likely that some or all of the other species of *Stegomyia* might be found capable of carrying yellow fever.

In the large Indian sea-ports, and particularly in Bombay and Calcutta, *S. fasciata* is a common insect. On the other hand, in the inland districts they are by no means abundant, and though widely distributed they are represented only by a few scattered individuals, while *S. scutellaris* is very common.

It is evident from this that if yellow fever were introduced into the country, and *S. fasciata* were the only carrier, the disease would be limited to the coast districts and sea-ports; but if S. *scutellaris* is also a carrier it might spread infection all over the country.

The distribution of the different species of *Stegomyia* in the larger sea-ports is now being ascertained with accuracy by a number of medical officers, and this investigation has particularly in view the seasonal occurrence and normal breeding-places of *S. fasciata*.

S. scutellaris breeds mostly in the small accumulations of water in the cut ends of bamboos, or in trees. The adult *Stegomyia* perish during the winter, while their eggs survive. These eggs are laid in water which at the beginning of the dry weather soon evaporates, but the eggs live on even if left dry, until the coming of rain and a proper temperature enable them to hatch. It is believed, though it is not yet wholly confirmed, that yellow fever can be conveyed by the offspring of an infected mosquito as well as by the parent itself. Therefore the plan advised by the writer aims at destroying all the hibernating eggs, suppressing as far as possible the casual natural breeding places, and at the same time providing artificial ones in which at suitable times all the eggs and larvæ might be destroyed.

97 - The Copra Itch.

1. — CASTELLANI, ALDO.: Note on Copra Itch.

2. — HIRST, STANLEY.: Report on the Mite causing Copra Itch. *The Journal of Tropical Medicine and Hygiene*, Vol. XV, No 24, pp 374-375, 2 figs. London, December 16, 1912.

1. — Already for some years past, the writer had observed that the persons working in the copra mills were affected by a peculiar eruption, which extended from the hands to the arms, legs, and trunk, but never to the face. The eruption much resembles scabies in its external appearance, except that no burrows or cunicula are present. It is due to quite a different parasite, which Mr. Stanley Hirst has named *Tyroglyphus longior* var. *castellanii*. This acarus was met with on the epidermis of the patients and in the copra dust. It does not appear to make true burrows, but seems to induce dermatitis in the same manner as *Pediculoides ventricosus* Newport, which lives in diseased cereals and produces an eruption in persons handling the latter.

The writer reproduced the disease experimentally. The eruption has very little or no tendency to heal spontaneously, unless the patient abstains for some time from his work in the copra mill. Beta-naphthol ointment (5-10 per cent.) has proved a very useful remedy.

2. — Mr. Stanley Hirst gives a description and figures of the parasite in question and mentions that according to Michael (" *British Tyroglyphidae* ", Vol. 2, pp. 123-131) *T. longior* has a very wide distribution in Europe and is found on most kinds of dried or preserved animal and vegetable matter, especially upon dried provisions.

98 - Experiments with Crude Carbolic Acid as a Larvicide in British Guiana.

WISE, K. S., and MINETT, E. P. in: *The Journal of Tropical Medicine and Hygiene*, Vol. 15, No. 23, pp. 358-359. London, December 2, 1912.

Floating larvicides, such as paraffin, either in its pure or crude state, and even heavy petroleum oil, are practically useless in British Guiana for, owing to the strong wind always blowing, and the absolutely flat open nature of the soil, such substances are quickly blown away to one side and evaporated before their asphyxiating properties come into play. In the case of large areas of water, such as drainage trenches, many larvæ can be destroyed by keeping the water well stocked with the small fish known locally as " Cockerbellies " and clearing away all floating vegetation as far as possible, but these fish are often unable to gain access to the many small depressions in the land holding temporary water. In these cases and under similar conditions in the laboratory the writers experimented with crude carbolic acid, using the larvæ of *Culex fatigans, Stegomyia fasciata,* other Culicidae, *Taeniorhynchus, Cellia albipes,* and *C. argyrotarsus.* Under natural conditions, the larvæ in most of the small pits when treated with carbolic acid were seen to die in about an hour, but in the case of the pupæ the time was much longer, frequently as much as 24 hours.

A dilution of 1 part of crude carbolic acid in 20 000 is completely efficacious. Purified carbolic acid acts more rapidly, but is not efficacious in such high dilutions; further, it evaporates more quickly. The water treated in this manner is not harmful to animals, but they do not drink it readily on account of its tarry odour and blackish colour.

The writers have observed that, owing to its containing some constituents insoluble in water, crude carbolic acid does not lend itself to being sprayed over large areas with a Mackenzie spray, but by constantly stirring the mixture in a bucket during the process a fairly satisfactory distribution can be obtained.

When a large area of ground containing a number of small holes such as foot prints, has to be treated, it has been found more satisfactory to use substances which mix more easily with water, such as cyllin, chloronaphtholeum, or Sanitas okol, although the expense is much greater.

99 - Agricultural Continuation Schools in Belgium.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

Cours d'Agronomie aux adultes. — *Ministère de l'Agriculture et des Travaux publics, Bulletin de l'Agriculture et de l'Horticulture*, Year II, No. 4. Bruxelles, 1912.

During the winter months 1912-13 agricultural continuation-school instruction will be imparted in 401 communes, and rural housekeeping courses will be held in 143.

They are distributed in the various provinces as follows:

Province —	Communes with continuation schools	Communes with housekeeping courses
Antwerp	28	5
Brabant	45	13
West Flanders	78	7
East Flanders	50	31
Hennegau	47	11
Liège	33	3
Limburg	48	44
Luxemburg	40	23
Namur	32	46

Of the 190 teachers who conduct the boys' continuation schools, 63 are elementary school teachers and inspectors, 52 agricultural teachers (ingénieurs-agronomes), 22 agricultural travelling lecturers (conférenciers agricoles), 29 professors and veterinary surgeons, 24 various (farmers, clergymen, etc.). The housekeeping courses are held by 35 lady teachers, mostly teachers in housekeeping schools or travelling housekeeping schools.

100 - Central Agricultural Shows in France in 1913.

AGRICULTURAL SHOWS AND CONGRESSES

Avis relatif aux concours centraux agricoles en 1913. — *Feuille d'Informations du Ministère de l'Agriculture*, Year XVII, No. 51, p. 2. Paris, December 24, 1912.

By the decree of December 18, 1912, the Minister of Agriculture has made known his decision that 8 central agricultural shows shall be organized in 1913 in the following towns: Antibes, Châteauroux, Epinal, Evreux, Gap, Montauban and Nantes. The Antibes competition will take place from March 10 to 16, 1913. The programme of this exhibition can be obtained by those interested from the Ministry of Agriculture and the prefectures of the Mediterranean district. The dates of the other shows will be announced later.

101 - Packing Industries' Exhibition in Paris, July to October 1913.

Exposition d'Emballages à Paris, Juillet-Octobre 1913. — *La Petite Revue agricole et horticole*, Year 19, No. 434, p. 6. Antibes, January 12, 1913.

From July to October 1913, there will be held at the Grand Palais of the Champs Elysées the first International Exhibition of packing and allied industries, organized by the " Syndicat National et Mutuelle-Transport réunis."

For all further information, apply to the Administration, 28 Rue Biscornet, Paris 12, or to the Commissariat général, Bourse de Commerce, N°. 63.

102 – Agricultural Shows in Great Britain in 1913.

Society holding Show.	Date	Place
Shire Horse	25-28 February	Islington (London)
Hackney Horse	4-7 March	»
Hunters' Improvement.	11-13 March	»
Polo and Riding Pony	11-15 March	»
Bath and West and Southern Counties . .	27-31 May	Truro
Royal Counties	10-13 June	Windsor
International Horse Show	20 June - 1 July	Olympia (London)
Royal Agricultural Society of England . .	1-5 July	Bristol
Highland and Agricultural Society of Scotland	8-11 July	Paisley
British Dairy Farmers	21-24 October	Islington (London)
Birmingham Cattle and Poultry Show . . .	29 Nov.-4 Dec.	Birmingham
Smithfield Club	8 12 December	Islington (London)

103 – Horticultural Exposition at St. Petersburg.

Daily Consular and Trade Reports, 15th Year, No. 292, p 1325. Washington, December 12, 1912.

Under the patronage of the Russian Department of Agriculture an International Horticultural Exhibition will be held at St. Petersburg in April 1913. The exhibition will consist of the following sections: Flower culture; decorative horticulture; hothouse plants and outdoor plants; pomology; fresh and preserved fruits; vegetables; preservation and use of fruit and vegetables; grains; bee-culture; silkworm culture; house plants; scientific section; scholastic section; tools, instruments, and material for horticulture; floral art and a commercial section.

104 – Stock-breeding Exhibitions Subsidized by the Government to be held in Uruguay in 1913-1914.

Fechas para la celebración de las Exposiciones subvencionadas por el Gobierno. — *Revista de la Asociacion Rural del Uruguay*, Year XLI, No. 10, p. 785. Montevideo, October 1912.

The Presidential Decree of September 10, 1912, has fixed the following dates and places for the stock-breeding exhibitions, subsidized by the

Government. Rural Societies have the power to organize non-subsidized fairs and shows.

Places where Exhibitions will be held	Date
Montevideo	Aug. 25, 1913
Salto	First Sunday in Sept. 1913
San Eugenio	2nd „ „ „ „
Rivera	3rd „ „ „ „
Melo	4th „ „ „ „
Paysandu	1st „ „ Oct. „
San Fructuoso	2nd „ „ „ „
Dolores	3rd „ „ „ „
San Rosa	4th „ „ „ „
Miñas	1st „ „ Nov. „
Mercedes	2nd „ „ „ „
Fray Bentos	3rd „ „ „ „
Molles	4th „ „ „ „
Lascano	1st „ „ Dec. „
Treinta y Tres	2nd „ „ „ „
Saradi del Yi	3rd „ „ „ „
Tranqueras	4th „ „ „ „
Carmen	2nd „ „ Feb. 1914
Nueva Helvecia	3rd „ „ „ „
Maldonado	4th „ „ „ „
Florida	1st „ „ March „
Puntas de Maciel	2nd „ „ „ „
San José	3rd „ „ „ „
Colonia	4th „ „ „ „
Durazno	1st „ „ April „
Rocha	2nd „ „ „ „

105 - Second International Congress of Instruction in Household Management at Gnent, Belgium, in June 1913.

IIe Congrès International de l'Enseignement ménager à Gand, Belgique, en Juin 1913. *Royaume de Belgique. Exposition universelle de Gand* 1913. *Deuxième Congrès international de l'Enseignement ménager. Invitation.*

It has been decided in conjunction with the International Office of Instruction in Household Management at Fribourg, Switzerland, that the second International Congress of Instruction in Household Management shall be held at Ghent in 1913, during the Universal Exhibition, towards the end of June.

Office of Secretary-General: 19, Rue Willems, Bruxelles.

106 - Third International Congress of Farm Women at Ghent, June 12 to 15, 1913.

IIIe Congrès International des Cercles de Fermières à Gand, du 12 au 15 Juin 1913. *Royaume de Belgique. Exposition Universelle de Gand* 1913. *3me Congrès International des Cercles de Fermières. Invitation.*

It is only fifteen years, at the most, since the first farm women's associations were instituted in Canada and the United States. Six years ago, they were established in Belgium and still more recently in Ireland, Poland, Austria, Hungary and France, and the formation of similar societies is announced at an early date in Germany and Spain. The first International Congress of Farm Women was held at Colorado Springs, United States in 1911; the second at Lethbridge, Alberta, Candada; the third will take place at Ghent in 1913 during the Universal Exhibition from June 12 to 15. Secretary's Office: 38 Rue du Pépin, Bruxelles.

CROPS AND CULTIVATION.

AGRICULTURAL METEOROLOGY

107 – Electric Niagaras in Recent Thunderstorms. (1)

LAFOREST, M. A.: Les Niagaras électriques et les recents orages. — *Journal de la Société Nationale d'Horticulture de France*, 4th Series, Vol. XIII, pp. 572-574. Paris, September 1912.

The electric niagaras which have been in use for eleven years in the department of Vienne are said by the inventors to have afforded complete protection from hailstorms during that period. This statement, contradicted by numerous inhabitants of those regions, was investigated by M. Turpain of Limoges in 1911; he reported that the instruments were of little value, and in the same year a building in Poitiers which bore the apparatus was struck by lightning and set on fire. Notwithstanding this evidence, a powerful instrument was installed at the top of the Eiffel Tower, which was to afford protection to the whole of Paris; yet during this last summer, on five distinct occasions that city experienced heavy hail and thunder storms, giving conclusive proof of the inefficiency of the electric niagaras.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

108 – An Application of the New Pedological Knowledge to Grasslands.

SMITH, W. G. and CRAMPTON, C. B. The Influence of Origin and Topography on Grasslands. — *British Association for the Advancement of Science. Dundee*: 1912. Section M (Agriculture), *m* 13. London.

This is one of the first applications of the new pedological, *i. e.* ecological, knowledge to agriculture in Great Britain.

The extent and distribution of grassland in each district of Britain depends much on the economic requirements, but the natural productive capacity is primarily determined by the nature of the soil and vegetation resulting from the past and present influences of climate and topography, and the distribution of rocks. Extensive tracts of existing grasslands have, under man's operations, replaced other types of vegetation, such as woodland, heath, moor and marsh. Such grassland is liable to change, since it is only a phase introduced into the history of the vegetation. Other areas of grassland are of natural origin, and remain relatively constant under conditions which alter very slowly.

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(1) See No. 622, *B.* April 1912. (*Ed.*).

Grasslands may be grouped into:

1) natural { a) stable
b) migratory according to its natural origin
2) artificially induced.

The area of stable grassland in Britain is limited, *e. g.*, chalk downs, and exposed hills and bosses of limestones and basic igneous rocks. The migratory types are widely distributed on alluvial areas and rain-washed slopes along the river and coastal belts, and on the flanks of mountains.

The changes which lead naturally to the evolution of grassland, and other changes leading to its retrogression, are therefore factors to be specially considered where maintenance or improvement of grasslands is in view. It is suggested that these conditions, taken in conjunction with observations on experimental plots, may aid in correlating information on different types of grasslands.

The stable types of grassland apparently owe their existence to the nature of the rocks and to the physiography, which limits the growth of trees and prevents leaching of the surface and stagnancy. Apart from the stable types there are the migratory types mentioned below:

a) Flushing of the slopes of moorland hills with water derived from springs, or with surface water bearing rain-wash, is favourable to the formation of grassland; this is specially well developed where the rocks are rich in lime or other bases, and where the flushing is temporary and periodic.

b) Recent deposits of alluvial clay loams in the higher parts of stream-courses support other types of grassland.

c) Other types are formed on the alluvial clay loams of the flood plains in the lower parts of river courses.

d) Maritime types occur in succession to salt-marsh on coastal flats, and also on steep coastal contours exposed to wind, salt spray and earth-creep, and where the nature of the surface prevents rapid leaching and the formation of heath.

The following conditions lead to the retrogression of grassland:

I. — In moorland districts, invasion by acid, humous, and ferruginous waters leads to deterioration, and in the case of alluvial sandy loams to the formation of pan and consequent stagnation and reversion to moorland.

II. — Continued leaching by rainwater removes the soluble salts from the upper layers of porous sandy loams and leads to production of heath.

III. — Alluvial grasslands and those of moorland flushes deteriorate by leaching when flooding is prevented; the low-lying clay loam alluvial suffers mainly from insufficient drainage.

IV. — Accumulation of humus because of acidity or insufficient grazing discourages the more valuable grasses.

V. — Grasslands may suffer depletion slowly through the continuous removal of wool and carcase.

109 - Rate of Movement of Nitrates in the Soil.

MALPEAUX, L. and LEFORT, G. (École d'Agriculture du Pas-de-Calais). La circulation des nitrates dans le sol. — *Annales de la Science Agronomique*, Year 29, No. 4, pp. 241-258. Paris, October 1912.

Six wooden boxes of 50 cm. cube were filled as follows :— 1) and 2) with sand containing 13.5 % of water, 3), 4), 5) and 6), with a loamy soil containing 16.8 % of water. Both soil and sand were tightly packed down. In 1) and 3) 10 gr. of calcium nitrate were put into a hole, 2.5 cm. in diam. × 3 cm. deep, in the middle of the box. In 2) and 4) 10 grams of sodium nitrate were similarly placed. 5) and 6) received respectively 20 gr. of calcium nitrate and 20 gr. of sodium nitrate sown in a small furrow 2 cm. deep and 40 cm. long running parallel to the near side of the box and about 5 cm. away from it. This side, in the case of 5) and 6), was also perforated by three rows of holes at 5 cm., 10 cm. and 15 cm. from the surface, the holes being 5 cm. apart in the rows. The holes were fitted with corks, and being 2 cm. in diam. allowed an augur of 1.5 cm. diam. to be introduced for sampling. Though the boxes were kept in a place with little ventilation, in order to reduce evaporation, it was found advisable to spray them with 2 litres of water each (equiv. to 0.31 in. of rain) after the experiment had been running 65 days. Samples were taken at 5 cm., 10 cm. and 15 cm. from the deposited nitrate, both in vertical and horizontal directions. The Grandval and Lafoux method was used for the analyses and the results are given in Table I.

Under the above conditions diffusion is evidently extremely slow ; even after four months the distribution of nitrate in the sampling zone is very unequal, the inequality being greater in the soil than in the sand. Vertical diffusion does not appear to be more rapid than lateral.

A second series of experiments was carried out in the field. A good loamy soil was selected and a strip of land marked out into 10 squares each 75 cm. × 75 cm. In the centre of these a hole was made with an iron peg and a charge of sodium nitrate introduced to the required depth by means of a glass tube. The hole was then filled up again with earth.

Plots	1 and 2 were controls.						
„	3 and 4 received	100 gr. of nitrate at a depth of					1 m.
„	5 and 6	„	75	„	„	„	75 cm
„	7 and 8	„	50	„	„	„	50 „
„	9 and 10	„	25	„	„	„	25 „

The surface of even-numbered squares was consolidated as far as possible, while the odd-numbered plots were hoed. Samples were taken from the surface with an augur, 8 cm. deep and at a distance of 5 cm. from the centre ; they yielded the results shown on p. 190.

TABLE I.

Dates of Sampling	Sand						Soil																	
	Ca (NO$_3$)$_2$			Na NO$_3$			Ca (NO$_3$)$_2$									Na NO$_3$								
	1			2			3			4						5			6					
	Horizontal diffusion			Horizontal diffusion			Horizontal diffusion			Horizontal diffusion			Vertical diffusion			Horizontal diffusion			Horizontal diffusion			Vertical diffusion		
	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm	10 cm.	15 cm.	5 cm.	10 cm.	15 cm	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.
May 20 (17 days)	* 150	1	1	50	1	1	135	4	5	33	8	5	—	—	—	120	4	4	28	5	4	—	—	—
June 15 (43 days)	350	30	5	385	20	5	362	15	6	50	10	5	25	7	5	400	25	5	60	10	6	20	7	5
July 1 (58 days)	180	50	7	228	28	5	187	26	10	39	11	5	26	5	5	200	35	5	38	8	6	23	5	5
July 11 (68 days)	105	54	8	124	28	8	116	46	7	24	10	8	—	—	—	150	42	6	26	13	5	—	—	—
July 24 (81 days).	85	51	10	110	36	10	106	40	5	19	11	6	38	13	5	123	44	6	22	15	8	29	14	8
August 15 (103 days)	95	44	8	83	54	5	100	44	8	20	17	10	47	11	9	110	40	9	26	18	11	35	15	10
August 29 (117 days)	79	60	9	70	63	7	115	55	9	38	21	12	51	12	10	100	30	10	32	20	13	35	32	13

(*) Nitrates are expressed in milligrams per 100 dry soil.

Plot		Nitrogen in milligrams per 100 dry soil			
		July 15 *	July 24	August 15	August 25
1 hoed	control	5	7	6	9
2 rolled		5	6	6	9
3 hoed	1 m	5	7	6	9
4 rolled		5	6	7	10
5 hoed	75 cm	5	7	10	18
6 rolled		5	10	13	21
7 hoed	50 cm	5	7	62	102
8 rolled		6	8	90	120
9 hoed	25 cm	5	18	18	18
10 rolled		5	30	27	25

(*) Experiment begun on this day
Total rainfall during experiment = 1.47 in

Though the movement of nitrates by diffusion alone would seem to be a very slow process, the state of things is evidently very different when they are caught up by the capillary current. In 31 days the nitrate deposited at 50 cm from the surface had reached the sampling zone, or in other words had travelled over 40 cm, while by diffusion alone it would hardly have travelled over 4 cm.

Between August 25 and the end of October, 5.45 in. of rain fell, and on Oct. 25 fresh samples were taken every 10 cm. in depth to examine the distribution of nitrates as affected by the rain. The analyses are given in Table III.

The rain had washed down the nitrates 20 to 30 cm on the hoed plots owing to their good absorbing surface, and there was a zone of maximum nitrate content for each original depth of nitrate. On the rolled plots there was a second zone of maximum nitrate content nearer to the surface, corresponding to the limit of penetration of the rain. On the whole the nitrates were at a higher level in the soil at the end of the season than at the beginning.

Practical conclusions. — When manuring beets, or other deep rooting plants to which it is usual to apply heavy top dressings of nitrate,

TABLE III.

Nitrates as Nitrogen in milligrams per 100 *dry soil.*

Depth	Controls		1 m.		75 cm.		50 cm.		25 cm.	
	Hoed 1	Rolled 2	Hoed 3	Rolled 4	Hoed 5	Rolled 6	Hoed 7	Rolled 9	Hoed 9	Rolled 10
0-10 cm	0.7	0.6	0.6	0.5	1.1	1.0	1.3	0.8	0.8	1.1
10-20 »	0.6	0.8	0.7	1.0	1.2	1.6	1.0	0.8	0.9	0.8
20-30 »	0.8	0.8	0.8	2.3	1.3	4.4	0.9	5.6	1.0	6.8
30-40 »	0.8	1.0	1.8	1.5	3.2	7.3	2.4	9.8	5.0	3.2
40-50 »	0.6	0.7	1.1	1.9	7.4	4.6	4.3	9.7	5.1	3.2
50-60 »	0.3	0.2	1.2	1.9	4.3	7.8	3.3	8.1	—	—
60-70 »	0.1	0.1	1.9	2.0	7.2	4.9	2.2	1.6	—	—
70-80 »	0.1	0.2	2.0	1.7	5.2	5.3	—	—	—	—
80-90 »	0.2	0.2	1.3	1.2	—	—	—	—	—	—
90-100 »	0.1	0.1	1.2	1.0	—	—	—	—	—	—

better results would probably be obtained in many cases if the nitrate were buried by an early ploughing or applied very early in the year, as in dry weather the nitrates must often remain quite at the surface and out of reach of the roots. Should they be washed a little too far, they would probably be brought to the root region again in a short time.

110 - New Researches on the Accumulation of Nitrogen in the Soil by Micro-organisms.

DVORAK, J. Studien über die Stickstoffanhäufung im Boden durch Mikroorganismen (Aus der chemisch-phys. Versuchsstation der böhm. Sekt. des Landeskulturrates für das Kgr. Böhmen an der k. k. böhm. Techn. Hochschule in Prag) — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XV, Part 9, pp. 1077-1121 + fig. 1 + diagr. 3, Vienna, September 1912.

The writer considers the fixation of nitrogen in the soil by micro-organisms as one of the most important questions connected with plant production. In three series of researches he investigates some of the principal factors of the phenomenon.

1. *Effect of some vegetable substances upon the assimilation activity of* Azotobacter chroococcum *Beijer.* — It is well known that carbohydrates supply assimilating bacteria with the necessary energy. Experimenting, in nutritive solutions, with some vegetable substances which frequently come into contact with the soil and contain carbo-

hydrates which may be utilized by bacteria, the following results were obtained in comparison with glucose.

Vegetable substance —	Carbon percent —	Atmospheric Nitrogen assimilated. Mg. per 100 gr. of Carbon —
Spruce needles	61.32	57.3
Oak leaves	55.24	89.5
Sycamore leaves	56.89	126.4
Maize leaves	49.03	280.3
Lucerne (green)	48.28	319.5
Wheat straw	51.04	325.4
Stubble	48 33	596.8
Lupins (green)	50 71	711.5
Clover (green)	49 67	1237.9
Glucose	39.97	1456 5

The chief conclusion to be drawn from these data is that the older the vegetable matter, the richer it becomes in ligno-cellulose and consequently less adapted as nutriment for the azotobacter. On the other hand, green stuff, and in a lesser degree roots and straw, contain substances which are easily hydrolised into forms adapted to consumption by bacteria. There are further other micro-organisms in the soil which prepare nutritive material for azotobacter, and there is a whole series of enzymes that render carbohydrates soluble.

2. *Effect of some energy-producing materials on the activity of micro-organisms in the soil.* — Several samples of a beet soil were treated with energy-producing materials, and the activity of the micro-organisms was determined as a function of the intensity of respiration measured by the amount of carbon dioxide given off during 21 days.

Energy-producing materials —	Carbon dioxide mg. average per 24 hours —	Percent of Carbon transformed into Carbon dioxide —
Soil	19.7	—
Soil + 10gr. carbon as glucose	755.4	42.14
" + " " " levulose	494.9	27.22
" + " " " starch	526.1	29.00
" + " " " cellulose	225.2	11.77
" + " " " oak leaves	328.7	17.70
" + " " " wheat straw	273.6	14.54
" + " " " clover (green)	1061.9	59.69

These determinations lead to the practically important result that of all the substances tried, green stuff is the best nutritive medium for the development of bacteria; in it they find, in favourable proportions, carbohydrates and nitrogen; besides, the carbohydrates are in a form which is more easily transformed by the enzymes contained in the bacteria themselves. Consequently green manuring increases the activity of bacteria, it causes a more intense respiration, it raises the temperature of the soil, while the greater development of carbon dioxide favours the porosity of the soil and in union with water facilitates the disintegration of insoluble phosphates and silicates.

3. *Soil biological absorption.* — In the economy of fertilisers in the soil, absorption phenomena play an important part:

a) physical absorption,
b) chemical ,,
c) biological ,,

The first two are fairly well known, not so the third, in virtue of which the substances that constitute the food of plants are retained in an organized form by micro-organisms. The writer defines the biological absorption of nitrogen as the difference between the amount of nitrogen absorbed by a sterilized soil and that absorbed by a non-sterilized one, that is the quantity of nitrogen that is retained by the vegetative and assimilating activity of the micro-organisms in the soil. The following data are characteristic: they were obtained by percolating during 30 days 250 cc. of decinormal solutions of ammonium sulphate, of sodium nitrate and of calcium nitrate through 250 grams of soil:

Nature of the soil	Humus: per cent. dry matter	Nitrogen absorbed: per cent. of nitrogen in			Carbon dioxide given off in six days mg. per 1 kg. of soil
		ammonium sulphate	sodium nitrate	calcium nitrate	
Virgin loam, neutral-acid . . .	3.27	10.23	5.12	4.02	30.6
Field, sandy loam, neutral . . .	2.20	14.10	7.60	6.30	42.5
Field, clayey loam, slightly alkaline.	2.45	17.22	9.21	7.14	45.4
Wood, loam, acid	7.52	8 81	3.98	3.20	28.6
Meadow, sandy loam, acid . . .	2.05	5 62	2.20	1.83	25.2

Practical conclusions:

1. — The biological absorption of ammoniacal nitrogen is much more intense than that of nitric nitrogen.

2. — In biological absorption the behaviour of sodium nitrate is similar to that of calcium nitrate.

3. — There is a connection between biological absorption and the reaction of the soil. The absorption of nitrogen is less active with an acid reaction than with a neutral or alkaline one.

4. — The production of carbon dioxide is an index of the biological absorption of the various soils.

It thus remains demonstrated that biological absorption is an essential factor in the assimilation of inorganic nitrogen in the soil.

111 - The Action of Quicklime on the Soil.

HUTCHINSON, H. B. in *British Association for the Advancement of Science; Dundee*, 1912. Section M (Agriculture), *m* 5. London

This paper gives an account of experiments designed to show how far the micro-organisms of the soil are affected by applications of caustic lime.

The addition of small quantities of quicklime to field and garden soils stimulates general bacterial growth, but large quantities cause an initial depression in the numbers of bacteria and the destruction of certain large protozoa, and a cessation of all biological processes. Conversion of the lime from the caustic form into the carbonate, or combination with soil compounds, is followed by a great increase in the numbers of bacteria and increased ammonification of soil compounds. The length of the period during which the bacterial growth is suspended would appear to be determined by the quantity of lime applied, the initial reaction of the soil, and the amount of organic matter present.

Pot experiments have been carried out with variously limed soils, and the crop results show close agreement with those obtained by bacteriological and chemical analyses.

MANURES
AND
MANURING

112 - The Original Chemical Composition of Peruvian Guano.

El suelo y los plantas. IV. Composición del guano de la islas. — *La Riqueza Agricola*, Vol. I, No. 10, pp. 643-649. + figs. 6. Lima, October 1912.

From the report furnished to the " Compañia Administradore del Guano " (3rd memoir) by the engineer, Sr. J. A. Lavalle Garcia, we are in possession of the following data respecting the original composition of guano and the nature of the deposits of this substance which occur on the islands off the coast of Peru.

The composition of Peruvian guano is very variable, and depends on the following factors:

a) The species of birds which produce it.
b) The geographical situation of the deposits.
c) The period of its formation.
d) The depth of the strata used.
e) The feather content.

Species of birds producing guano. — In spite of the resemblance in the food and in the digestive system of the birds (1) which produce guano, the composition of their excrement is not identical, as might have been supposed; this is shown by the following comparative table:

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(1) Judging from the illustrations, the Alcatráz is a species of Pelican, the Guanay a Cormorant, and the Piquero an Albatross. (*Ed.*).

Chemical composition of the excrement of the chief guano-producing birds, per cent.:

	Alcatraz	Guanay	Piquero
Water	14.57	18.95	5.58
Substances insoluble in acids	0.39	0.47	2.40
Ash	27.46	36.06	72.70
Substances soluble in water	38.86	44.96	15.40
Chlorine	0.54	0.10	0.35
Chlorine reckoned as sodium chloride	0.89	0.17	0.58
Total nitrogen	15.54	11.76	5.46
Organic nitrogen	12.18	8.12	2.02
Ammoniacal nitrogen	3.22	3.50	3.30
Nitric nitrogen	0.14	0.14	0.14
Phosphoric acid	10.15	13.10	5.75
Potash	0.67	1.94	2.07
Lime	9.16	13.16	7.20

These data show the superiority of the guano from "guanais", which is further confirmed by the nature of its nitrogen content:

	Alcatraz	Guanay
Organic nitrogen	78.38	69.05
Ammoniacal nitrogen	20.72	29.76
Nitric nitrogen	0.90	1.19
Total nitrogen	100.00	100.00

Geographical situation of the deposits. — The richness of guano in nitrogen varies according to climatic conditions and consequently according to the geographical situation of the deposits; thus, the guano of the islands north of Callao is poorer in nitrogen and richer in phosphoric acid than that of the islands lying to the south, on account of the larger rainfall, which occasionally causes a loss of nitrogen. The respective amounts are as follows:

		Nitrogen per cent.	Phosphoric acid per cent.
Lobos Island	N. of Callao	10.80	27.69
Guañape ,,		10.95	28.00
Macabi ,,		10.90	72.60
Chinca ,,	S. of Callao	14.20	24.10

Period of formation. — As time goes on, the guano deposits become poorer, especially in nitrogen, either on account of the rain producing fermentation processes, lixiviation and volatilization, or from the action of the wind, which removes the finest particles.

From experiments made at the Sugar-Cane Experiment Station in Lima, it appears that the losses of nitrogen undergone by guano exposed to the weather are as follows:

	After 10 days	After 30 days
Rich guano	10.44 %	11.94 %
Poor guano	8.00 %	8.00 %

Depth of the layers. — The nearer the layers are to the ground, the more pebbles and sand and the less active organic matter they contain.

Feather content. — The feathers in guano are from their nature rich in nitrogen; their average composition is as follows:

	Per cent
Nitrogen	14.00
Phosphoric acid	2.64
Ash	7.84

In order to make the guano more homogeneous, the large feathers are removed by means of sieves.

These data respecting the natural conditions of the guano deposits reveal the very variable composition of this fertiliser, and assist in estimating the differences in it; thus the amount of nitrogen, which is the principal element in guano, utilized by the plants can be calculated:

	Per cent of total nitrogen
Organic nitrogen	55
Ammoniacal „	30
Nitric „	1

The total utilization is thus 86 per cent.; it the losses due to the weather are taken as 10 per cent., and those occasioned by leaching as 5 per cent., the total amount of nitrogen used by the plants would be 70 per cent.

113 - Philippine Guano.

COX, ALVIN, J.: *The Philippine Journal of Science*, Vol. VII, No. 3, pp. 195-199. Manila, 1912.

The phosphatic guanos of the Philippine Islands consist of the excreta of sea fowl and other birds, bats and marine animals, with more or less bone and animal matter furnished by dead bodies, and are found in large quantities in some places, mainly on small islands and in numerous limestone caves. That from caves is usually bat excrement. Deposits of bat guano have been discovered on a great many of the islands, chief among which are Marinduque, Guimaras, Luzon and Mindoro. The deposits in some of the caves consist of one or more thousands of tons.

Probably as yet not over 1000 tons of guano have been mined in the whole Archipelago.

The writer summarizes in a table the results of 55 analyses of Philippine guanos executed by the "Bureau of Science." The following are the maxima and minima:

Moisture	Nitrogen	Nitrogen as Ammonia (NH_3)	Phosphoric Acid (P_2O_5)	Total potash (K_2O)
0.4-68.45	0.10-8.81	0.22-9.93	1.4-23.12	trace-9.10

114 - The Presence of Arsenic in Plants.

AGRICULTURAL BOTANY, CHEMISTRY AND PHYSIOLOGY OF PLANTS

JADIN, F. and ASTRUC, A. La présence de l'arsenic dans le règne végétal. — *Journal de Pharmacie et de Chimie*, Year 104, Series 7, Vol. VI, No. 12, pp. 529-535. Paris, December 16, 1912.

It is known, especially owing to the researches of A. Gautier and G. Bertrand, that arsenic is normally present in animals; but until now, little was known of the existence of this substance in plants.

The writers therefore undertook a series of experiments on the normal occurrence of arsenic in the latter. They analysed more than 80 species, adopting the process employed by A. Gautier and modified by G. Bertrand.

The analytic results for each plant are given in a long table from which the following figures, referring to the most common plants, are taken:

	Arsenic in mgr. per 100 gr.	
	Fresh material	Dry material
Orange (pulp)	0.011	0.079
Tangerine orange (pulp)	0.012	0.085
Haricot beans	0.010	0.012
Chickpeas	0.009	0.010
Lentils	0.010	0.012
Dried peas	0.026	0.030
Beans	0.020	0.046
Celery	0.020	0.232
Lettuce	0.023	0.387
Potatoes	0.008	0.031
Chestnuts	0.005	0.011
Hazelnuts	0.011	0.011
Walnuts	0.013	0.013
Bananas (pulp)	0.006	0.033
Dates	0.012	0.017
Asparagus	0.010	0.075
Rice	0.007	0.008
Maize	0.030	0.036
Barley	0.050	0.055
Oats	0.050	0.062
Black truffles	0.020	0.085

From the results obtained, the writers draw the following conclusions:

a) It seems that arsenic is of general occurrence in plants and therefore this element must be of importance for the activity of the protoplasm.

b) Even parasitic plants, not in direct contact with the soil, contain arsenic, which is indispensable for their proper development. Further, there is no relation beteen the amount of arsenic in the parasite and that contained by the host plant

c) From the arsenic content of any given plant, it is not possible to deduce accurately the amount present in plants belonging to the same botanical group.

d) In any individual plant, the green parts contain more arsenic than those which are not exposed to the light.

e) One of the sources of the arsenic normally present in the organs of animals is the plants which have provided them with food.

115 - Mode of Action of Weak Solutions of Electrolytes on Germination.

MICHEELS, H Mode d'action des solutions étendues d'electrolytes sur la germination. — *Bulletin de l'Académie Royale de Belgique* (Classe des Sciences), No 11, pp 753-765. Bruxelles, 1912

The writer used wheat grains and the same apparatus as described in his previous papers (1). He started with a $\frac{N}{100}$ solution of potassium chloride, and measured the effect of adding chlorine, potash and hydrochloric acid to electrified and non-electrified solutions. He also used sulphuric acid, electrified solutions of copper sulphate, and finally a $\frac{N}{1000}$ solution of potassium chloride.

As a result of these experiments, the conclusion is reached that the effect, favourable or otherwise, of electrolytes on germination is due to a disturbed state of equilibrium of the solution — that is to the liberated cations or anions — and not to the acidity or alkalinity produced by the electrolysis. Further, it is suggested that the ill effects of the solutions are caused by a colloidal precipitation within the root cells.

116 - The Chemical Composition of the Oat Kernel. Variety and Variation.

BERRY, R. A The Oat Kernel — *British Association for the Advancement of Science: Dundee*, 1912. Section M (Agriculture), *pp* 8. London.

This paper gives results obtained from an extensive series of over 700 complete analyses of the oat kernel extending over several years. The oats were grown at the Experiment Station of the West of Scotland

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(1) Action des solutions aqueuses d'electrolytes sur la germination. (*Bull. de l'Acad. roy. de Belgique* (Classe des Sciences), 1909, p. 1076). -Action du courant galvanique continu sur la germination (*Ib.*, 1910, p. 51). Action des liquides anodiques et cathodiques sur la germination (*Ib.*, 1910, p. 391).

Agricultural College, on various farms in the West of Scotland, and, in addition, in 1911 at a few centres in the South of England and Wales.

VARIETY. — By tabulating the grain of over a hundred varieties, according to the percentage and weight of kernel, along with the chemical analyses, the writer has distinguished several more or less well-defined types:

The White Grains: 1) small grains with a thin husk, a high percentage of oil, and an average percentage of nitrogen; these are characteristic of and include the old Scotch varieties with the new strains selected from them; 2) large grains fall into two groups, (*a*) a thick husk, a low percentage of oil, and high nitrogen, (*b*) a thin husk, a higher percentage of oil, and a lower nitrogen; 3) grains intermediate in character and chemical composition include the bulk of the newer hybrid varieties.

The Black Grains: 1) small grains with a thick husk, low oil, and average nitrogen, 2) medium grains with a thick husk, high oil, and low nitrogen; 3) large grains with a thin husk and the richest kernel of the cultivated oats.

These are the winter oats. The reddish and yellow grains form separate groups. The wild oat surpasses all in richness of kernel.

VARIATION. — In this respect the results show that climate is the most disturbing factor. Distinguishing characters associated with a certain set of climatic combinations become greatly modified and, in some cases, almost obliterated when the conditions are radically changed. Scotch seed sown in the South of England and Wales in the dry and warm summer of 1911 yielded grain of smaller and drier kernel, a thick husk, higher nitrogen, and lower oil and weight per bushel than grain grown in Scotland. The cooler and more humid climate of the West of Scotland and the longer maturation period produces in the grain the opposite tendencies, except in the poorer and drier localities. The average variation of the grain of over 63 varieties grown annually from 1909 to 1911, under the less extreme climatic conditions prevailing at the Experiment Station, was in comparison small. The unusually warm summer of 1911, however, gave a slightly larger kernel with a thinner husk, slightly poorer in oil and richer in nitrogen than the grain of 1909-10, and would resemble the effect of the normal English summer.

Time of sowing and ordinary dressings of manures produce little effect on the grain. Soils rich in nitrogen produce grain richer in this element.

Foreign and Colonial oats are usually, but not invariably, small, thick husked, relatively rich in oil and nitrogen, and of low weight per bushel; as a rule they have a short maturation period.

OIL AND NITROGEN. — Micro-chemical tests show the oil to be located in the aleurone layer and the embryo. The latter forms from 2.5 to 4 per cent. of the kernel, and contains between 11.25 and 12.25 per cent. of the oil, and between 4.5 and 6.5 per cent. of the protein of the whole kernel. The smaller grains of the same variety are invariably richer in oil but slightly poorer in nitrogen. Analyses made every three days during the formation and maturation of the grain show the oil to increase rapidly in the first half, then remain stationary, whilst nitrogen increases all through the period.

The results seem to show that the variation of the principal constituents of the oat kernel is greater than is usually supposed.

117 - On the Application of Precipitine Reactions to Seed Identification.

ZADE. Die Verwendbarkeit der Prazipitinreaktion in der Samenprufung. — *Fuhling's Landwirtschaftliche Zeitung*, Year 61, No. 23, pp. 807-810. Stuttgart, December 1, 1912.

The present methods of seed examination only determine in a limited manner the quality and source of the seeds: thus it is not possible to distinguish (without previous cultivation experiments) a winter from a summer wheat; nor an awned from an awnless variety. In the same way, the nature of the seeds of leguminous fodder crops is only ascertained and, then not with absolute certainty, from the impurities found among them. Relander (Studien über die Verwendbarkeit der Präzipitinreaktion in der Samenprufüng, *Abhandlungen der Agrikulturwissenschaftlichen Gesellschaft in Finland*, Heft 1: Helsingfors, 1911) has begun a series of experiments with the object of adopting the precipitine method for seed identification; this method is based upon the knowledge acquired respecting the immunity of animals to infectious diseases and which the writer briefly summarizes.

The blood of infected animals has a specific reaction, *i. e.* it gives a precipitate in the presence of a culture (filtered) of the bacteria which it contains, but none in the presence of a culture of other bacteria. To these reactions the name of precipitines is given. Further, an animal into the blood of which the albuminoids of another species have been introduced, has the power of reacting in conformity with these (albumino-precipitines). Thus, a rabbit which has been inoculated with horse serum gives a precipitate (of albumino-precipitine) in presence of horse serum, but not in the presence of the serum of any other animal. This method, which is a very delicate test, has been adopted for recognizing the blood of different animals, and recently for discovering the differences in the albuminous substances of the lower and higher plants, and thus determining the degree of affinity existing between different plants.

The manner of proceeding is as follows: A sample of wheat, for instance, is reduced to a fine powder, and treated with a given quantity of a physiological solution of sodium chloride. The extract is filtered and injected in small quantities repeated at fixed intervals (3 to 10 days) into the blood of the animal which is the subject of the experiment. Then a small amount of the blood of the animal is taken and freed from corpuscles by centrifugation; the residue, called the immunised serum, is filtered till it becomes completely clear. On adding to the filtrate in a test tube some drops of the wheat extract which was used for the injection, a precipitate is obtained, which is not produced if extracts are introduced which have been prepared from other seeds. The reaction is thus specific and can serve as a diagnostic. The practical value, however, would be very small if this method only served as a way of distinguishing one species from another, since this is effected already by direct examination. Relander's experiments have shown the possibility of obtaining from precipitine reactions a greater amount of differentiation than is furnished by direct seed examination. He found that the serum of a rabbit wich had been injected with an extract of two-rowed barley reacted in the presence of a similar extract (the reaction being more energetic for the same variety than for different ones), while there was no reaction in the case of six-rowed barley.

It should be noticed that there is not always an agreement between botanical affinity and bio-chemical homology, and that certain species can be identified by the bio-chemical method more easily than others. Thus, two-rowed barleys form anti-bodies much more easily than do six-rowed varieties. In only one case was there a similar reaction from two-rowed and six-rowed barleys. This, Relander explains as due to the fact that the two-rowed barley in question was the product of a cross with a six-rowed barley.

The experiments made with red clover showed that the Relander method serves to distinguish Italian and American clover seed from Finnish and Norwegian, but the two latter are indistinguishable from one another.

The writer mentions, in conclusion, that the results hitherto obtained justify the hope that the precipitine method will prove a valuable assistance in seed identification.

118 - On the Inheritance of some Characters in Wheat: I.

HOWARD, A. and HOWARD, G. L. C. (Agricultural Research Institute, Pusa) in *Memoirs of the Department of Agriculture in India (Botanical Series)*, Vol. V, No. 1, pp. 1-46. Calcutta, September 1912.

The results of hybridisation experiments carried out at Pusa during the years 1905-1912 are given. In all cases the work was started from pure lines, and the paper deals chiefly with three series of crosses with Indian wheats:

1. *Felted* × *Smooth Chaff*. — The felting of the chaff in the wheat examined is shown to be due to at least two kinds of hairs, each of which acts as a single Mendelian factor and is inherited independently of the other.

2. *Red* × *White Grain and Red* × *White Chaff*. — Red colour in the grain may be due to the presence of one, two or three independent Mendelian factors, each of which may be isolated and is capable of producing red colouration alone; but the shade thus produced varies. In one case studied, the effect of two red factors combined in one grain was cumulative. Only one factor was found to occur in all the crosses between red and white chaffed wheats.

3. *Bearded* × *Beardless and Black Awned* × *White Awned*. — The presence of at least two Mendelian factors in the bearding of wheat is

demonstrated, and in future a sharp distinction will have to be drawn between wheats which are absolutely beardless and those with very short awns or tips. Only one factor was found to occur in the cross between black awned and white awned wheats.

Less extensive investigations were also carried out on:

1) *The consistency of the grain,* by crossing a constant soft wheat with a constant translucent wheat. Consistency in this case appeared to be due to a single Mendelian factor.

2) *The shattering of the ear,* which appeared to be due to two Mendelian factors.

3) *The standing power of the plant,* by a cross between a weak strawed well rooted wheat, and a strong strawed wheat with inferior rooting capacity. All possible combinations were found, and the prospect of obtaining a well rooted, strong strawed wheat in the future seems favourable.

In none of the crosses was there any indication of dominance in the first generation, which in all cases proved intermediate.

CEREAL AND PULSE CROPS

119 - A Summary of Experiments in Barley Growing conducted during the Eleven Years 1901-1911.

HUNTER, H. in *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XIII, No 1 Dublin, October 1912

The experiments were commenced in 1901 in Cork and Tipperary, but the work was soon extended, and in time included all the barley-growing counties in Ireland. At first the size of the plots was two statute acres each, but after 1908 this was reduced to one acre.

Malting Experiments. — For a number of years the produce of the various plots was malted by Messrs. Guinness, and a sample from each subjected to chemical analysis in their laboratories. The figures in all cases agree with those obtained by previous experimenters, the highest quality barleys being those characterised by a low total nitrogen content.

Results will be discussed in detail later when the question of yield and quality is reviewed. With regard to the weight of 1000 corns, assuming equal quality, large grains give better extracts than smaller ones, but in practice it is found that the former do not mature as readily nor to the same degree as the latter, and are in consequence rarely of such good quality.

Variety Experiments — The varieties tested were:

a) Narrow-eared — Archer, Scotch Chevallier, Hallett's Chevallier, Old Irish and Danish Archer.

b) Wide-eased — Goldthorpe and Standwell

A summary of the results is given in the following tables:

I. *Comparison of average values of Archer with other varieties.*

	No. of Tests	No. of years	Yield * brls.	sts.	Av. value p. acre ** in shillings	% difference in favour of Archer
Archer	67	8	11	12	182	8.3
Goldthorpe			10	4	168	
Archer	28	5			166	20.3
Goldthorpe			9	14	154	
Standwell			8	14	138	
Archer	25	3	11	14	179	11.0
Scotch Chevallier. .			10	15	163	
Archer	15	2	12	12	194	12.8
Old Irish			11	9	172	
Archer	11	1	13	5	201	16.9
Hallett's Chevallier.			11	4	172	
Irish Archer . . .	28	4			$190\,^{1}/_{2}$	— 0.1
Danish Archer . .					$190\,^{3}/_{4}$	

* Yield = quantity of saleable malting barley given in "barrels" = 16 stones = 224 lbs.

** Value per acre = value of total crop, *i. e.* malting corn + screenings.

II. *Comparison of average nitrogen content of Archer and other varieties.*

	No. of tests	No. of years	% nitrogen in grain
Archer	66	8	1.53
Goldthorpe			1.52
Archer	24	4	1.56
Standwell			1.64
Goldthorpe			1.55
Archer	25	3	1.54
Scotch Chevallier .			1.63
Archer	15	2	1.55
Old Irish			1.69
Archer	11	4	1.55
Hallett's Chevallier			1.66

Both for quality and yield, Archer heads the list, and the only objection that can be urged against it is its tendency to late ripening; this can usually be obviated by early sowing. In the broad-eared class Goldthorpe proved superior to Standwell and also to two other varieties of Goldthorpe raised by the Department. The comparison of Archer and Goldthorpe does not show marked superiority for either variety: in every year excepting 1901 the value per acre of Goldthorpe on some of the plots has exceeded that of Archer, but there is not sufficient evidence to warrant the general statement that the former is more suited to certain soils or districts than the latter. Goldthorpe is liable to serious loss by its ears falling off the straw, to which defect Archer is immune;

for this reason its claims to general recommendation clearly outweigh any that can be advanced in favour of Goldthorpe.

Pure Seed Raising Experiments.—These were originally started on account of the difficulty experienced in obtaining pure seed of the different varieties that were being tested. In 1904 it was decided that in future the progeny from *single ears* was to be used, but to bridge over the time which must elapse before a sufficient amount of seed could be produced from this source, "group selection" was practised, *i. e.* a large number of ears from each variety were selected, and the grain used for seed production. In 1906 a selection of Archer was introduced from Denmark, where many single ear cultures have been propagated, and tested against the unselected Irish Archer which had been grown under the Department's supervision since 1904, and which was at least 94 per cent. pure. In 1907 the "group selected" Irish Archer was tested against the Danish Archer, and in 1908 the "single ear" culture of Irish Archer was ready for trial. The following figures indicate the value of the selection-factor on the yield and quality of the barley crop:

		Yield — brls.	 sts.	Value per acre in shillings —	Nitrogen content %
1906	Irish Archer	11	12	174	1.52
	Danish ”	12	9	185	1.46
1907	Irish Archer	12	2	187	1.55
	Danish ”	12	7	192	1.56
1908	Irish Archer	11	2	188	1.44
	Danish ”	11	4	187	1.48

The superiority of the Danish Archer, which amounts to 11s. per acre in 1906, is reduced to 5s. per acre in 1907 and to nil in 1908. These experiments suggested a further trial of the extent to which the change of seed from one locality to another is beneficial. Danish Archer was freshly imported from Denmark in the spring of each year, and compared with Irish Archer and Danish Archer grown in Ireland since 1906, with the following results:

Year	Irish Archer		Danish Archer imported 1906		Danish Archer freshly imported each year	
	Value per acre shillings	% N.	Value per acre shillings	% N.	Value per acre shillings	% N.
1906	174	1.52	185*	1.46	—	—
1907	187	1.55	191	1.54	192	1.56
1908	188	1.44	184	1.43	187	1.48
1909	220	1.47	222	1.46	224	1.47
1910	159	1.55	161	1.54	159	1.53
1911	187	1.64	188	1.64	—	—

These figures leave no room for any conclusion other than that no difference either in yield or quality exists between Danish Archer seed grown in Ireland for one or more seasons and freshly imported seed.

120 - The Cultivation of Rice in Java.

SIMON, S. V.: Studien über den Reisbau auf Java — *Der Tropenpflanzer*, Nos. 9-12, pp. 459-484, 527-542, 581-591, 645-660. Berlin, Sept.-Dec. 1912.

This paper is the result of observations made by the writer in Java, and of abstracts of recent publications on the subject, chiefly by the Dutch Government.

Importance of rice culture in Java. — The production of rice in Java is high (5.2 million tons of paddy in 1909), but insufficient for the consumption of the country. The rice is distinguished by its good quality. In the western part of the Island, rice fields occupy the whole of the cultivable area both on the plains and on the mountain slopes, on which they are arranged as terraces and reach up to 3900 feet.

Rice is grown by the natives in small farms; only exceptionally, and by Europeans, on large estates. The Government takes much interest in the progress of the cultivation of this cereal. Experiments bearing on rice growing are conducted at several experiment stations and especially at the one of Tjikömöh to which a school of agriculture for the more educated natives is attached.

Rice is cultivated in Java in two ways, either in "Sawahs" or "Tegalans." The first are terrace-like perfectly level fields, surrounded by embankments and irrigated artificially or watered only by the rainfall. They are broad and regularly shaped in the plains, narrow and irregular in form on the hill slopes; the tegalans are always on inclined and uneven soil; they are not banked round and are watered only by the rain. A sharp distinction between dry and wet rice fields does not exist in Java, because rains fall throughout the year; they are always abundant in the western part of the Island, but less so from May to August (that is during the eastern monsoon) in a part of the east of Java. About 2 per cent. of the "sawahs" occupy swampy lands or those situated on the shores of lakes (Moeras-Sawahs). In 1909 in Java and Madura (not including the principalities of Djokjakarta and Soerakarta) the total area under rice was 6 106 418 acres, of which 3 556 378 ac. were irrigated sawahs, 1 892 530 ac. sawahs depending upon rainfall and 539 940 ac. tegalans. The moeras-sawahs occupied 117 572 acres.

Irrigation works. — The most important irrigation works and canals were constructed and are kept up by the Government or with its assistance. Thus the "wadoeks" or reservoirs of rainwater arranged as terraces on the hill slopes in the residencies of Soerabaya, Rembang and Semarang were improved and are kept in repair by Government aid. The upkeep of the secondary canals devolves on the communes and on the landowners.

The lesser irrigation works and sometimes the preparation of the rice fields are carried out in common by the inhabitants of each village.

The canals are fed by small barrages across the rivers; they branch into lesser canals which convey the water to groups of rice fields, the number of which ranges from 3 to 20, but most frequently from 4 to 6, each of which is situated on a lower level than the preceding ones.

Irrigation experiments. — The irrigation water is almost the only fertilizer used in the rice fields. L. G. den Berger, chemist of the Department, conducted in the Tjikömöh Rice Experiment Station a series of accurate experiments on the distribution of the mineral matter dissolved and held in suspension in the irrigation water, on the quantities of it that were deposited and on their effect upon the crops.

As a result of this experiment he came to the conclusion that for a good distribution of the water and of the fertilizers it contains, it would be advantageous to alternate the fields that are the first to receive the water from the irrigation canals.

The excessive deposition of silt in the fields that first receive the water must be avoided, especially if it is calcareous, because it would diminish the permeability of the soil, or if too rich in organic substances, as this would favour vegetative growth too much at the expense of the yield.

Soils. — For the most part they are very clayey, deep, and of fine and regular texture; they are poor in humus (rice fields rich in humus have frequently an acid reaction, which does not suit rice) and in lime; they are also frequently relatively deficient in phosphoric acid. Especially in the western part of the island laterite soils prevail. The black alluvial soils of volcanic origin in the Passoeroean residency, especially rich in apatite, are the best of Java and give very heavy crops. In central Java there are recent volcanic soils containing much potash and deficient only in nitrogen; when they are manured with sulphate of ammonia they give excellent crops.

Varieties and selection. — The earliest varieties mature within four months from sowing, the latest in six or seven months. Besides *Oryza sativa, O. glutinosa* is also cultivated; both of them possess many varieties, some being more suitable for growing in sawahs, others in tegalans, some are bearded, others beardless, some early, some late. The Rice Experiment Station has isolated and cultivated experimentally 800 good native varieties, the selection of which has been begun on the Svalöf lines.

Rotation. — After the first rice crop (October to March), that is during the west monsoon, if the rice field is irrigable the soil is left fallow for about a month, during which time the harvested paddy is dried and stored; then the field is again flooded and the cultivation of rice is repeated.

Rice may be grown on the same field for several years in succession, as is often done in the moist parts of western Java. At most, two crops a year can be obtained, but those varieties which require 7 to 9 months from sowing to harvesting and yield three crops in two years are preferred, as they give a better product.

In West Java, especially in the Preang regency, the cultivation of rice alternates from time to time with the rearing of gold fish. Two months are sufficient for the fish to attain a marketable size.

If during the east monsoon there is not enough water available, one part of the fields is put under rapidly growing dry crops such as earth nuts, Bambarra groundnuts, soy beans, cowpeas, moon beans, several kinds of capsicums (lombok), sweet potatoes, yams ; and in the very dry districts, especially of eastern Java, a good deal of maize is grown, as well as sorghum, millet, coix, etc. and, among the plants intended for sale, tobacco. Sometimes, after rice, the soil is left fallow for a few months and utilized as pasture for buffaloes and other cattle.

The crops which follow rice in the rotation, are arranged in the following decreasing order of merit according to their property of oxidizing the soil and of preserving its fertility: Leguminosæ; other dry crops ; fallow with grazing ; fish rearing. Flooding the soil without any cultivation is absolutely to be condemned, also because it favours the spread of weeds, especially *Pontederina crassipes*. *Special rotations* are found where the cultivation of the sugar cane or of tobacco is much practised(1). After sugar canes, if there is sufficient water, the rice fields are immediately prepared ; in the contrary case, which is frequent, Leguminosæ are grown for two or three months. Anyhow, by March or April the paddy must be harvested to make room for the preparation of the soil for sugar canes, which are planted from April to July.

Cultivation in the sawahs. — The work of preparing the ground lasts about 50 days. Care is taken not to make the seed beds in too fertile soils. The rice is sown 30 to 40 days before transplanting. Formerly only whole ears were sown; now the sowing of the separated grains is preferred. The seeds that float on the water are discarded; the rest are steeped in water for two or three days, being kept in baskests in running water.

One pound of soaked rice is enough for about 8 sq. yds. of seed bed ; and 390 sq. yds. of seed bed are sufficient for one acre. The seed-beds are moderately irrigated or not at all. In the first case the seedlings can be planted out 30 to 40 days after sowing; in the second sometimes as many as 100 days are necessary. The use of dry seed beds is continually spreading. Before removing the seedlings from the seedbeds these are well irrigated if they are dry beds ; if, on the contrary, they are flooded beds the water is turned off. In western Java the seedlings about 12 to 16 inches high are tied into small bundles and a half or one third of their haulms are cut away. The seedlings are set mostly in rows in the dry or almost dry fields. In the Preang regency two to four seedlings are planted in each hole ; a group of two or three plants gives on average 15 to 20 haulms. The distance at which the seedlings are placed from each other varies considerably. In the plains, varieties having a long period of vegetation and consequently freely tillering, are placed at intervals of 8 to 10 inches, while short-lived varieties that do not tiller much are planted at 5 to 6 inches apart; in the mountains, in poorer soils, the intervals are still less.

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(1) See MIEHE, H. Der Tabakbau in den Vorstenlanden auf Java. — *Der Tropenpflanzer*, 1911, Year 15, No. 9. pp. 468-479. Berlin, 1911. See also No. 134 below. (*Ed.*).

In the first days after transplanting the rice is moderately irrigated; after 15 to 20 days it is flooded. Shortly afterwards the first weeding is undertaken. Then for two or two and a half months about 4 inches of water are kept on the land. In the second half of this period the second and last weeding is carried out, the water being turned off two days previously and admitted again two days after. When the ear begins to form the depth of the water is diminished, and when the ears begin to turn yellow the water is completely turned off.

Cultivation in the tegalans. — The rice is mostly cultivated together with other crops, bananas or herbaceous plants. In this case as many as three crops a year are harvested, for instance: maize, rice and sesamum. Tegalans are frequently used to begin the cultivation of land which up till then had been under bush. This is cut, allowed to dry and then burnt, the ground is broken up and sometimes divided into rough terraces to prevent too much earth being carried away by the rains. After the rains of the western monsoon, the rice is sown in holes. The second rice crop is about $^{2}/_{3}$ of the first, and the third does not always cover expenses. The poorest soils, after several harvests, are left to themselves for some years, during which they get covered with bush; the ground is then broken up again. In 1909 there were 2 712 500 acres of regularly cultivated tegalans, of which only 525 000 ac. under rice. The burning of forests followed by the growing of mountain rice (as it is still practised in Siam and in the Sonda Islands) is unknown in Java.

Harvest. — The rice is reaped very high, in two or three times, removing the ears singly by means of a special knife with a curved blade. The reapers are paid in kind, from $^{1}/_{25}$ to $^{1}/_{5}$ of the quantity reaped, most frequently $^{1}/_{12}$ or $^{1}/_{11}$; those who, besides reaping, have assisted in the preparation of the soil or in transplanting the seedlings, get from $^{1}/_{5}$ to ¼.

Successive operations. — When the rice sheaves are dry they are put in huts with interwoven bamboo sides and roof of alang-alang (*Imperata arundinacea*). After 40 days husking begins. For this purpose wooden mortars are used, and only the quantity consumed in the course of the day is husked at a time. In Java there are also mills for the mechanical husking of rice; most of them belong to Chinese. They are driven by water power and are of a somewhat primitive character. The rice they turn out has a good many broken grains and is not suited for exportation, the supply for which comes from the European mills of Batavia and neighbourhood.

Yield. — The average yield of irrigated rice fields is about 7120 lbs. per acre; of rice fields depending only on rainfall 4750 lbs. per acre, and from tegalans about 3560 lbs. per acre.

Diseases and pests. — " Omo poetih," which means white disease, is a kind of etiolation which attacks the seedlings in the seed beds and mostly disappears on transplanting ; it is caused by insufficiency of plant food or by mouldiness of the seed beds ; it is frequent but not very injurious. " Omo bang " or " mentek " appears only 40 or 50 days after planting out; it is caused by *Tylenchus oryzae*, which attacks the roots. This disease is at present limited to the central parts of the island, and has sometimes caused very considerable losses. The only remedy hitherto known is to alternate rice with dry crops.

The larvae of *Schoenobius punctellus* devour portions of the internodes of the haulm, which in consequence produces ears with no grains in them.

Leptocorisa acuta sucks the juice from the ripening grain and sometimes does much mischief.

In April and May at times a nocturnal insect, called by the natives "walang-sangit" appears in great swarms which would destroy whole crops if they were not controlled by the lighting of fires in which they burn their wings.

Among vertebrates, voles are the most injurious. Their numbers are kept down by protecting the great rice field snakes (*Python bivittatus* and *P. reticulatus*).

Among birds the most harmful are *Amadina oryzivora*, several species of *Munia*, etc. (1).

121 - The Cultivation of Rice with the Help of Machines.

MAIN, F.: La culture mécanique du riz en Indochine.(2). — *Journal d'Agriculture tropicale*, 12th Year, No. 137, pp. 321-325. Paris, November 30, 1912.

The writer, in analysing the monthly reports of the Indo-Chinese Rice-growing Association, points out the importance of the results obtained in 1912 by M. Alazard, agricultural engineer, attached to the Association, who after having shown the necessity of improving the plant used in the mechanical tillage of the soil, claims to have solved the problem of weeding by cutting the reeds under water by means of a mower. By sowing directly in the rice field, vigorous and fertile plants are obtained.

It has likewise been proved that machines can be used for ploughing normal rice fields, that is those exposed to flooding during several months, and that transplanting is not indispensable in order to obtain a crop. These two points are of capital importance, as well as the fact that reeds are not an unsurmountable obstacle to the cultivation of rice and that the rice grower possesses suitable machines for their destruction. The use of this means is connected with the observation of certain physiological conditions of the existence of plants : when plants are mown under water the crown and the roots are asphyxiated and die rapidly; thus the reeds that are mown do not send out new shoots. These results, especially considering the conditions under which they have been obtained, are sufficient to encourage further efforts in the cultivation of rice with the help of machines.

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(1) See No. 27, *B.* Jun. 1913. (*Ed.*).

(2) See No. 1612, *B.* Dec. 1912. (*Ed.*).

122 - Cambodia Soy Beans.

Soya de Cambodge. — *L'Agriculture pratique des pays chauds*, 13th Year, No. 116, p. 410. Paris, November 1912.

The Colonial Garden has lately had occasion to examine a sample of soy beans from Cambodia. This sample was analysed in the laboratory of the Chemical Service and found to contain:

Water . . .	7	per cent
Proteins	41.6	„
Fat . . .	18.6	„

The fat content of this soy is rather high, the average being only 17 to 18 per cent.

This soy, submitted to expert brokers, was judged to be of good quality and of easy sale. Cambodia seems capable of producing large quantities of this pulse. According to information received it is cultivated in Cambodia only for local consumption.

FORAGE CROPS, MEADOWS AND PASTURES

123 - Experiments in Growing Lucerne of Various Origins in Denmark.

HANSEN, P. Dyrkningsforsög med Lucerne fra forskellige Avlssteder. — 63 Beretning fra Statens Forsögsvirksomhed i Plantekultur. — *Tidskrift for Landbrugets Planteavl* Vol. 19, Part 3, pp. 377-411. Copenhagen, 1912

Comparative experiments in growing lucerne of various origins were carried out between 1901 and 1907 on the experimental fields of the Danish Service for Plant Selection. These experiments were a continuation of a preceding series extending over the period from 1884 to 1899, and dealt with 40 samples from Hungary, 19 from Germany, 21 from France, 13 from Italy, 17 from Russia, 2 from Spain, 12 from America and 4 from Turkestan, altogether 128 samples grown in 610 plots.

From the results as a whole the following general conclusions may be drawn, taking into due account the conditions of Denmark.

Hungarian lucerne may be considered from the Danish point of view as the best and the safest. All the samples proved good, and with but slight differences. Its chief merits are its permanence and resistance to cold. The first cut gives the major portion of the yearly crop, the successive cuts yielding very little; in the year in which it is sown and in the succeeding one Hungarian lucerne is somewhat less productive than the other varieties.

German lucerne is mostly a hybrid of *Medicago sativa and M. falcata*; it is very luxuriant in the year in which it is sown and in the succeeding year, but afterwards it becomes less productive, possessing a low permanence. Compared with Hungarian lucerne, German lucerne does not yield as much at the first cut, but the successive cuts are somewhat more abundant.

French lucerne, according to the samples tested, was uneven, some being good, but most inferior to Hungarian lucerne. The first year's crop of French lucerne was more abundant than that of the Hungarian lucerne, but its permanence was inferior.

Italian lucerne behaves like French lucerne, only its permanence is inferior.

Russian lucerne: the few samples tested gave good results for the first year's crop, but the yield diminished from year to year.

The samples of American, Spanish, and Turkestan lucerne gave scanty results, showing themselves unsuitable to conditions obtaining in Denmark.

Taking as basis the following general averages for Hungarian lucerne:

Yearly yield in cwts. per "Tondeland" = 1.362 *acres.*

I Year	II Year	III Year
64 65	89 54	154 49

and expressing the yield of the other varieties tested as percentages of the above, the following comparative figures are obtained:

Origin	Crop		
—	I year	II year	III year
Hungarian	100	100	100
German	102	92	89
French	102	96	97
Italian	104	96	90
Russian	91	83	69
American	45	49	67

These figures represent the suitability of the various lucernes to the cultural conditions of Denmark.

124 – The Exportation and Importation of Clover and Lucerne Seed into Hungary in 1910-11 and 1911-12.

FOELDVARY. Külkereskedelmi heremagforgalmunk kétévi eredményének összehasonlítása. — *Mezögazdák*, Year IX, No. 22, p. 184. Budapest, November 30, 1912.

The production of clover and lucerne seed in Hungary differs according to the climatic conditions, and while almost none in abnormally dry or damp years, the crop is lucrative when the season commences with an abundant rainfall and concludes with a prolonged period of heat. When the damp continues, the clover succeeds the better, while if the heat predominates, the lucerne is the more satisfactory crop.

After reserving seed for home use, the rest of the produce is exported, indeed sometimes even some of that needed for sowing, the deficiency being made up by imported seed; this trade depends on many factors, commercial, agricultural and especially climatic. This is shown by the following table for the commercial years of 1910-11 and 1911-12.

Clover Seed.

	Exports		Imports	
	tons	£	tons	£
Wet summer 1910 Commercial year 1910-1911)	4 741	270 848	1 196	75 919
Dry summer 1911 Commercial year 1911-1912)	2 320	138 298	2 026	138 285

Lucerne Seed.

	Exports		Imports	
	tons	£	tons	£
Wet summer 1910 Commercial year 1910-1911)	648	43 889	332	25 295
Dry summer 1911 Commercial year 1911-1912)	1 095	71 342	279	21 864

It is seen that the revenue derived from the export of clover seed (the imports having been deducted) during the wet year was £199 953, while in the dry year it was only £13. But on the other hand, the lucerne in the wet year fetched only £18 594, as against £49 478 in the dry year. The result is that the clover years are the most favourable for Hungary; in the present case the net total revenue from clover seed in 1910 was £212 689, as against £49 491 only from lucerne in 1911

The statistics show that the export trade is greatest in autumn and the import before sowing. The Hungarian seed is sold after the harvest at from £4 9*s*. to £7 3*s*. per cwt., and before the time of sowing, foreign seed is bought at from £7 to £8 12*s*., the higher price the latter fetches being due to its greater purity.

FIBRE CROPS

125 – Cotton Growing in Lousiana.

SPAHR (Hohensholm, La). Die Zuckerrohr-, Baumwoll- und Reiskultur in Louisiana. B. Der Baumwollbau (1). — *Der Tropenpflanzer*, 16th Year, No 11, pp. 591-607 + fig Berlin, November 1911.

Cotton growing began in Louisiana towards the end of the seventeenth century; Siamese white lint cotton was introduced in 1758.

Climatic Conditions. — Louisiana is now one of the principal cotton growing countries of the world, and this chiefly owing to its climate: relatively high temperature (from April to November: the lowest mean monthly temperature in November in Northern Louisiana being 7.7°C., the highest, also in Northern Louisiana, in July, 34.3° C.); long period of vegetation; a good deal of sunlight (from June to September: completely cloudy days 19.4 in North Louisiana and 21 in S. Louisiana); regular and well distributed rains during the growing period (on average 4 3/4 inches per month from June to September) and dry weather during the ripening period.

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(1) For the article on sugarcane see No. 128 below. (*Ed*).

Soil. — Cotton can be raised on all kinds of soil, though with varying success. On sandy soils the plants develop less; on heavy soils they attain, especially in wet years, considerable height, but in proportion to their size do not yield much lint. The same in low lying lands: in favourable years the crops are good but in others they are much damaged by animal and vegetable pests. The most favourable of all are medium loams. However, with the aid of manuring and suitable tillage even the less favourable soils can be made to yield satisfactory crops.

Cultivation. — As there is still a good deal of uncultivated land, cotton growing might have considerably extended if it had not been checked by the appearance of the boll weevil (*Anthonomus grandis* Boh.), which has not only set a limit to further extension but has obliged many planters to give up cotton altogether.

Rotations. — Those most commonly adopted are the following:

a) 1st year cotton, 2nd year maize then cow peas.

b) 1st and 2nd years cotton, 3rd year maize and 4th year cow peas.

c) 1st year cotton, 2nd maize and cowpeas, 3rd winter oats (sown at the end of October or beginning of November) then cowpeas (sown on the stubble in May).

d) as the preceeding, but with cotton for two years or in the 3rd year sowing in the oats Japanese clover (*Lespedeza striata*) which occupies the 4th year also. On loams sometimes *Vicia villosa* or clover is sown in the oats; on sandy soils crimson clover is sown in the oats and Velvet beans in the maize or, these by themselves, or peanuts, especially the Spanish variety.

Preparation of the Soil. — Is not always carried out with due care. Sometimes it consists in merely ploughing up the ridges of the previous year before sowing. The best results are obtained by those farmers who begin their ploughing towards the end of autumn or beginning of winter. Among other advantages there is that of destroying many pupae of boll worms (*Heliothis armiger*). In the large estates the subsoil plough is also used; by this means alone the crop of seed cotton increases by about 150 lb. per acre. After ploughing, which is done crosswise to the direction in which the cotton will be planted, the ground is repeatedly harrowed, and rolled until a garden-like tilth is attained. In low lying ground the rows are ploughed, so that the soil may dry better if the weather is unfavourable. On high land this is done only just before sowing or is omitted altogether.

Manuring. — It is often defective. Experiments carried out for many years in succession at the Baton Rouge and Calhoun Experiment Stations have proved the necessity of completing organic manures by chemicals. The best results were obtained with 30 bushels per acre of a compost consisting of 100 bushels of cotton seed, 100 bushels of farmyard manure, and 2000 lbs. of phosphate. At Calhoun, land manured with this compost yielded an average of 1513 lbs. of seed cotton per acre, and at Baton Rouge 1246.6 lbs., whilst the unmanured plots yielded only

466 lbs. and 1034.3 lbs. respectively. The quantity of artificials given to cotton in Louisiana is trifling.

Varieties. — Early varieties are grown, especially short stapled, small bolled, Upland varieties. Long stapled early varieties (Sea Island) have been bred and the United States Department of Agriculture is endeavouring to introduce them, but their cultivation and harvesting are more difficult, and for ginning them special gins are required; further they do not sell well on the local markets and they require continuous selection; for these reasons few planters care to grow them. The most widely spread varieties are the following:

1) Tooles Early Prolific. Short staple and small bolls. About 87 bolls give 1 lb. of seed cotton. It is a low early bush, and it produces much seed cotton and lint.

2) King's Early Improved. Short stapled, abundant, seeds small, long branches.

3) Simpkin's Early Prolific. Short stapled, somewhat earlier and more productive than the preceding long branches, short internodes, seeds small.

4) Mebane's Early Triumph. Short stapled, large bolls. Seeds medium sized. 46 bolls yield 1 lb. of seed cotton.

Many farmers in the north of the cotton belt use imported seed. This ripens earlier than the native seed but every two years new seed has to be imported.

In most cases the seed is taken from the ginning works. Many farmers get their seed from merchants or direct from the growers, especially in Georgia, S. Carolina and Alabama. Only a few of the largest farmers produce their own good seed by means of selection.

Interculture. — The seeds are sown in rows as early as possible when no more frosts are to be expected (March-April). The quantity of seed is 1 bushel (30 lb.) per acre, though as experiments conducted in Texas by the Bureau of Plant Industry have shown, 4 to 7½ lbs. of seed per acre are sufficient under favourable conditions to give a good stand.

The distance between the rows ranges from 3 to 5 feet and between the plants from 10 to 30 inches according to the soil and the variety of cotton grown. According to the writer the advice to plant at a great distance apart is not sound beyond a certain limit, because formerly the cotton plants continued producing buds till September and even October, whilst now the plants produce only up to the middle of August, because after this date the boll weevil prevents any further bud formation. Experiments carried out by the State Crop Pest Commission in the years 1907 and 1908 showed that close planting gave the best results, increasing the crop by 30 to 60 per cent. The most favourable distances were found to be:

	Between the rows	Between the plants
1. On poor high land	3 feet	10 inches
2. On rich high land and good prairie soil	3 ”	12 ”
3. On poor or very sandy plain land	3½ ”	12 ”
4. On well drained plains of medium fertility . .	4 ”	15 ”

These experiments showed also that in close planting the ants (*Solenopsis geminata*) played more havoc among the boll-weevil brood than heat or parasites.

A few days after sowing, the tilling of the soil begins again in order to keep the surface loosened. At first the harrow is used and then the cultivator. Singling is performed twice, once when the plants are about one inch high and the second time when they are 12 inches high; after this they are slightly earthed up, and, weather permitting, the ground is worked once a week with the cultivator. At the end of July or beginning of August the soil is smoothed and thoroughly harrowed.

Topping has been given up.

Harvest. — The harvest begins usually at the end of August and lasts to the middle of December. The quantity picked by one labourer in a day varies considerably. Some barely reach 100 lbs., others pick 300 to 350 lbs., first class pickers attaining 500 and 600 lbs. The cost of picking is about 75 cents (3*s.* 1*d.*) per 100 lbs.

The cotton is not dried before being ginned. Ginning is done in special mills which deal with at least 50 to 75 bales a day and in some instances as many as 250 per day. The cost of ginning a bale is $2.50 (10 *s.* 3 *d.*). As payment seeds are accepted. In 1906 there were upwards of 1500 ginning mills against 1200 in 1911. The seeds that are not used for sowing are sent to the oil mills, of which there are about 50 in the State.

Yield. — The average yield has increased somewhat of late years, but it is only about 170 lbs. of lint per acre (in 1911 it reached only 143 lbs. per acre). With intensive farming and energetic control of the boll weevil it is possible to attain much higher yields, as is proved by statistics which show that as much as 356 lbs. per acre have been obtained.

Control of parasites. — The boll weevil appeared for the first time in 1830 at Monclova in Mexico, where in 5 five years it played such havoc that cotton growing had to be given up; in 1850 it reached Matamoras and 10 years later the Rio Grande. In 1862 it appeared at Brownsville, Texas, and in 1903 in Louisiana. By the end of 1908 it infested the whole cotton territory of the State. The harm that it has done may be seen from the following figures (next page).

For the direct control of the boll weevil, arsenate of lead sprays have been suggested, but owing to the difficulties attendant upon its use this remedy has not become popular. On the other hand the practice of collecting the infected bolls from the beginning of May to the end of July has become general. The bolls are placed in boxes covered with wire netting, the meshes of which are wide enough to allow the parasites of the weevils to escape but not the weevils. It would be of very great advantage

Year	Under cotton acres	Lint 500 lb. bales
1902	1 617 586	882 073
1909	930 000	253 412
1911	1 075 000	365 500

to destroy the cotton plants early in autumn, but few growers make up their minds to do so. The utility of this measure, besides being proved by the experiments of the State Crop Pest Commission, has been shown by the immunity from the pest enjoyed by the plantations grown in localities in which the cotton plants had been destroyed by frost in the preceding year, as was the case in the northern parishes of Louisiana after the frost of 1907.

For destroying the plants at the end of the season some machines have been invented, one of the simplest of which consists of a cylinder of 18 inches diameter and 6 feet in length bearing sharp iron bars 3 inches broad and 1½ inch thick. With this machine 10 to 12 acres a day can be cut.

Before the appearance of the boll weevil those varieties the bolls of which ripened before the danger of frost was to be apprehended were considered early. Now early varieties are those that show first the setting of fruit buds. The signs of precocity are: low branches (the main branches that do not bear fruit must not be more than four); short internodes; fruit branches at every internode of the main stem or of the main branches; continuous growth of the fruit branches, as the boll weevil attacks first the upper twigs and does not damage the bolls so long as there are available buds; the average breadth of the leaves for the plants of the high lying lands must not be more than 6 inches and for the plains not more than 4 or 5 inches.

In selecting, the following points are also to be observed:

1) Size of the bolls (the larger bolls being easier to pick and offering greater resistance to bad weather).

2) High percentage of lint (38 to 40 per cent.).

3) Length of staple not under one inch.

4) Resistance to bad weather.

126 - Cambodia Cotton in Bombay Presidency.

MAIN, T F. in *The Agricultural Journal of India*, Vol. VII, Part IV, pp 373-381 Calcutta-London, 1912.

The seed of Cambodia cotton was introduced into the Madras Presidency from Pondicherry through two independent channels in 1904 and in 1905 (1). In the Bombay Presidency it was introduced from the Philippine Islands in 1905, and from Tonking in 1906. Later on seed was obtained from the Madras Presidency as well as from various other sources.

Experimental trials were commenced in Gujerat, but the local conditions (a heavy black cotton soil and a rainfall of 36.33 inches) did not appear to suit this cotton, which was then transferred to Dharwar in the south of the Presidency, where it yielded promising results for a year or two and then appeared to deteriorate as regards prolificness and resistance to "red leaf blight" which attacks all exotic cottons at Dharwar. On the contrary, good results were obtained in the south-east of the Dharwar District, where Dharwar American cotton, introduced nearly a century ago, had acclimatized itself, and is cultivated as a non-irrigated crop, being grown in the *rabi* season on the medium black soils and sown at the beginning of the monsoon on the red soils. Accordingly an experimental farm was established at Gadag in 1908-9, with the primary object of testing the suitability of newly introduced American and Cambodia cottons and for comparing these with the Dharwar American.

The results obtained — without irrigation — both on the farm and in cultivators' fields, prove this cotton to be well adapted for cultivation at Gadag. The following table shows the results of comparative experiments with local saw-ginned Dharwar American.

Season	Yield per acre of seed cotton in lbs.		Ginning percentage		Remarks
	Cambodia	Saw-Ginned Dharwar American	Cambodia	Saw-ginned Dharwar American	
1909–1910. .	430	384	42.80	30.87	
1910–1911. .	410.5	221	38.30	30.70	A moderate season
1911–1912. .	197	101	38.05	28.30	A very bad season.

The season 1911-12 was characterized by exceptional drought. The total rainfall for the season amounted to only 13.77 inches, of which only 0.80 in. fell after the crop was sown, against an average of 23.43 inches. Nevertheless the above results afford the proof that Cambodia cotton is a drought-resisting variety of exceptional capacity.

(1) Cambodia cotton has spread rapidly in the Madras Presidency, where it succeeds only with irrigation. It is distinguished for its vigour, high yield and good quality of lint. On well manured land under irrigation the yield is usually stated to be from 1250 to 1600 lbs. of kappas and never less; while yields as high as 2500 lbs. have been reported. It has a ginning percentage of 33 to 35 per cent. of lint. H. SAMPSON., The introduction and spread of Cambodia cotton in the Madras Presidency. — *The Agricultural Journal of India*, Vol. VI, Part IV, pp. 365-368. Calcutta-London, Oct. 1911 (*Ed.*).

Cambodia cotton has further the following advantages over the local saw-ginned Dharwar American: A higher ginning percentage; the seed cotton, being produced in large well-opening bolls, can be picked cleaner; the cotton is "bulkier," its colour is brighter and the staple more uniform, and lastly it is markedly resistant to "red leaf blight." (1) At a sale by auction held in 1912, Cambodia cotton fetched 43 per cent. more than the local variety. The spinning tests also yielded satisfactory results.

Among the sub-varieties of Cambodia, 102 E proved to be the best, and the economic results that may reasonably be expected from it are given as follows:

	Cambodia 102 E	Saw-ginned Dharwar American
Cost of production per acre	18s. 8*d.*	18s. 8*d.*
Yield: seed cotton, per acre	310 lbs	275 lbs.
Price of 1 lb. unginned cotton	1.85*d.*	1.42*d.*
Value of produce per acre	47*s.* 9*d.*	32*s.* 9*d.*
Net profit per acre	29*s.* 1*d*	14*s.* 1*d.*

It would therefore increase very considerably the wealth of the district if the 200 000 acres annually devoted to saw-ginned Dharwar American were sown with Cambodia 102 E.

The writer concludes by demonstrating the necessity of continuing the selection of the Cambodia seed, so as to prevent any falling off in its qualities, of multiplying the selected seed on a large scale, and lastly of preventing cultivators allowing this cotton to become mixed with the local variety.

127 – The Improvement of Cotton in India.

The Bulletin of the Imperial Institute, Vol. X, No. 3, pp. 351-372. London, 1912.

During recent years the Provincial Agricultural Departments in India have carried out experiments with a view to the improvement of indigenous varieties and the trial of exotic cottons.

Many samples of cotton produced in the course of these experiments were sent to the Imperial Institute, and the present article gives an account of the examination and commercial valuation of specimens from Madras, Central Provinces, United Provinces, Eastern Bengal, Assam and Burma (2).

Madras cotton. — One of the chief native forms of cotton cultivated in Madras is known as "Tinnevelly." This really consists of a mixture of two varieties, "Uppam" a small bolled variety of *Gossypium her-*

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(1) "Red leaf blight" (Physiological Disease). This reddening, resembling autumnal coloration, occurs most frequently toward the season's end and is most common upon poor soil. It is chiefly due to lack of nourishment. Attacks of the mite cause a similar appearance. STEVENS and HALL, *Diseases of Economic Plants*, pp 405-406. New York, 1910.

(2) See No. 102, *B.* Jan. 1912. (*Ed.*).

baceum, and " Karunganni " a form of *G. indicum*. " Uppam " is grown on black cotton soils in Coimbatore and Madura practically as a single variety. It is also grown mixed, usually with " Karunganni " and " Nadam " (a form of *G. obtusifolium*) in the east of Salem, south of South Arcot and north of Trichinopoly. It is also grown throughout the black soil areas of Tinnevelly as a single crop or as mixtures containing as little as 5 per cent., the remainder being " Karunganni ". The latter is to some extent grown also on red, mixed and shallow soils; it is a finer, stronger and more even stapled cotton than " Uppam " and the Agricultural Department is endeavouring to extend its cultivation in Tinnevelly.

Among the exotic cottons which have been introduced, "Cambodia" (1) has proved the most successful, and it is said that on irrigated land it gives four or five times the yield of the dry land indigenous cottons, whilst the quality of the lint is satisfactory. In Tinnevelly and Ramnad, wells are being sunk on a large scale with the primary object of growing this cotton. The last crop was estimated at 33 000 bales of 400 lb., valued at £400 000.

The comparative examination of the Madras cottons carried out at the Imperial Institute has shown that " Karunganni " approximates in fineness to Egyptian cotton (length from 0.8 to 1.1 in. and the average diameter 0.00074 in.) while " Uppam " has the ordinary coarse character of most Indian cottons (length from 0.9 to 1.1 in. and average diameter 0.00084). In other respects the " Karunganni " cotton is little if at all superior to " Uppam ". It yielded on ginning 28.1 per cent. of lint as against 29.5; the weights of lint per 100 seeds were respectively 1.90 grams and 2.15. " Cambodia " is of very satisfactory quality (yield on ginning 37.9 per cent. of lint or 6.89 grams per 100 seeds; length from 0.9 to 1.2 in.) and resembled samples of the same variety of cotton grown in Burma.

The Georgia Upland Cotton is of good quality (yield on ginning 37.1 per cent. of lint or 5.27 grams per 100 seeds, and length from 0.9 to 1.2 inches) but inferior to the acclimatised Cambodia cotton.

Samples of cotton from the Central Provinces. — The chief work of the Agricultural Deaprtment in the Central Provinces on cotton has been the selection of improved forms from the native races of cotton.

The cotton known as Berar " jari " consists of a mixture of a number of distinct races. Six of these have been isolated, and five of them, viz. *Gossypium neglectum* var. *vera*, *G. neglectum* var. *vera* sub-var. *malvensis* (broad-lobed and narrow-lobed forms), *G. neglectum* var. *rosea*, and *G. neglectum* var. *rosea* sub-var. *cutchica*, have been grown experimentally as pure varieties. The *vera* and *malvensis* forms furnish the most valuable lints, but the coarser *rosea* and *cutchica* varieties yield a higher percentage of lint and would be the more profitable for cultivation in the Central

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(1) See preceding abstract (No. 126). (*Ed.*).

Provinces. In the Tapti valley the finer types predominate; the others in Berar, Wardha and Nagpur.

The variety of native cotton known as "Bani" (*G. indicum*) yields a fine silky staple, but as the yield per acre and the percentage of lint are low its cultivation has been given up in favour of "jari." "Buri" has been introduced and has done better than jari on certain rich "khari" lands. So far it has proved immune to wilt disease (*Fusarium vasinfectum* Atk.) and is in demand where this disease is prevalent.

Experiments designed to ascertain the relative values of the outturns of the above mentioned cottons have been carried out at the Akola Experimental Farm during several seasons.

The plants were grown on the deep black soil characteristic of the cotton tract and were manured with cattle dung at the rate of 40 lbs. of nitrogen per acre. The results of the experiment are shown in the following tables:

	Average outturn of seed cotton per acre for four years	Percentage of lint 1910-1911	Average value outturn for four years calculated from rates for 1910-1911
	lbs.		£ s d
G. neglectum, malvensis	373	30.00	3 16 5
G. neglectum, vera	343	33.60	3 18 11¼
G. neglectum, rosea	402	40.00	4 13 1½
G. neglectum, rosea cutchica	412	36.30	4 7 11¾
Berar « jari »	371	35.70	3 17 8¾
« Buri »	203	33.00	3 17 3
« Bani » (*G. indicum*)	255	29.00	2 18 10½

These samples from Akola were of high grade for Indian cotton, but they were of somewhat inferior strength. With the exception of "cutchica" they were all of a much higher class than "superfine." The growing of these cottons should be encouraged in prefernce to the inferior "jari" varieties, which are now so largely produced.

Cottons of the United Provinces. — The chief cotton produced is of an inferior grade, known as Bengals. Several crosses have been obtained of this cotton which give promise of being a considerable improvement on existing varieties, but none are quite satisfactory and probably the introduction of some form of Upland would be advisable.

The two samples received by the Imperial Institute for examination were specimens of indigenous varieties grown at the Government Agri-

Results of the examination of the samples of cotton received from the Akola Experimental Farm.

	«Buri» acclimatised «American Upland»	«Bani» (*G. indicum*)	Broad-lobed *Malvensis*	Narrow-lobed *Malvensis*	*Vera*	*Rosea*	*Cutchica*	«Jari» (*G. neglectum*)
Fibre yield on ginning . .	30.8 to 33.15	25.15 to 27.5	28.2	28.45	33 to 33.7	40.55 to 40.6	34.8 to 38.5	32.1 to 37.8
Lint per 100 seeds, grams.	3.4 to 3.9	1.60 to 1.85	2.2	2.4	2.36 to 2.9	3.25 to 4.3	3.03 to 3 4	2.3 to 3.4
Length of staple, inches .	0.7 to 1.3	0.7 to 1.1	0.7 to 1.2	0.7 to 1.2	0.7 to 1.1	0.6 to 1.2	0.55 to 1.0	0.6 to 1.2
Average diameter, inches .	0.00074	0.00069	0.00083	0.00053	0.00082	0.00088	0.00091	0.000815

cultural Station, Aligarh. One, the white-flowered country cotton (Rui), yielded on ginning 40.5 per cent. of lint, or 3.26 grams per 100 seeds. The staple was short (from 0.5 to 1 in). and coarse (average diameter 0.0009 in.); and the other, yellow-flowered country cotton (Rui), yielded 35.7 per cent. of lint, or 2.39 grams per 100 seeds, the length of the fibre varied from 0.6 to 1.1 in. and the average diameter was 0.00081 in.; this cotton was of good quality but somewhat deficient in strength.

Cottons from Eastern Bengal and Assam. — Cotton is grown on a commercial scale only in the Garo Hills and Chittagong Hill Tracts. In both localities the variety grown is *Gossypium arboreum* var. *assamica* Watt, but the ginning percentage of the Garo Hill cotton is considered to be slightly higher than that of the other locality (50.1 per cent. against 43.5 per cent. in the samples examined at the Imperial Institute); the fibre of both samples was rough short (0.7 to 0.8 in.).

Cotton from Burma. — Experiments in cotton growing have been carried out at the Mandalay Agricultural Station, the work being confined for the present to the trial of introduced cottons and the classification of the indigenous cottons. The perennial or tree cottons have not been satisfactory. In the following table a summary is given of the results obtained in the years 1909 and 1910, together with the results of the examination at the Imperial Institute. The annual cottons were sown in drills three feet apart, without manure.

It would appear that the Egyptian varieties are less suited to the conditions of the localities in which the samples were produced than the American and "Cuban" cottons. All the samples, however, were of marketable quality, but with the exception of the "bani" variety they were rather lacking in strength and were slightly stained, doubtless by insect pests.

Variety	Yield of Seed cotton — lb. per acre	Percentage of lint by ginning	Weight of lint per 100 seeds — grams	Length of fibre — inches	Average diameter of fibre — inches	Colour of fibre
Abassi (first year) . .	416	30.5	3.6	1.3 to 1.6	0.00067	Cream colour
Abassi (second year) .	150	35	5 0	1.1 to 1.4	0.00066	Pale reddish brown
Mitafifi (second year) .	750	33	5.3	1.2 to 1.6	0.00065	Pale reddish brown
Cuban (new seed) .	390	28.5	3.3	0.8 to 1.1	0.00086	Pale cream
Georgia Upland (new seed)	250	31.5	3.5	0.9 to 1.1	0.00074	Pale cream
Bani (first year) . .	—	26.9	1.75	0.8 to 1.2	0.00068	Greyish-white
Cambodia	—	38.5	5 6	0.7 to 1.3	0.00073	Pale cream

SUGAR CROPS

128 - The Cultivation of the Sugar Cane in Louisiana.

SPAHR (Hohenshoim, La). Die Zuckerrohr-, Baumwoll- und Reiskultur in Louisiana. A. Die Zuckerrohrkultur (1). — *Der Tropenpflanzer*, 16th Year, No. 10, pp. 517-526 + 5 figs. Berlin, October 1912.

The yearly consumption of sugar in the United States is 80 lbs. per head, being inferior only to that in England where it reaches 86 lbs. per inhabitant. The United States produce about one quarter of the sugar they consume, namely about 900 000 tons a year. Another quarter is imported from the American possessions: Hawaii, Porto-Rico and the Philippines, and the rest chiefly from Cuba. Of the sugar produced in the United States about 350 000 tons are cane sugar, of which southern Louisiana produces 325 000 tons (1910), which with the by-products is worth upwards of £6 200 000.

Area of cultivation. — The chief area on which sugar cane is raised extends southwards from the confluence of the Red River along the west bank of the Mississippi and its former emissaries. The breadth of the cultivated land varies from a few hundred yards to three English miles. Behind the cultivated belt the wooded swamps, in which the drains flow, are situated. The sugar belt comprises about one million acres of land, of which about 300 000 are yearly under sugar, and the rest under maize, rice, potatoes, pulse, lucerne, etc. The cultivation of sugar canes might be extended to about 9 millions of still virgin soils; on the other hand, if the protective duties on sugar were abolished the cultivation of sugar canes would be condemned to disappear; consequently the erection of new sugar factories and the increase of the area under canes proceed very slowly.

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(1) An abstract of the article on cotton appears as No. 125 above. (*Ed.*).

Varieties cultivated. — 1) "Louisiana" or "Domestic" cane, with red cane and slanting leaves; it is suitable for clayey soils.

2) "Ribbon": red cane striped with white, slanting leaves, very resistant to moisture and suitable to clayey soils.

3) "D. 74": dark green cane, erect leaves, high sugar content, fairly resistant to moisture and to drought, adapted to loose soils that do not cake.

4) "D. 95": with purple epidermis and parenchyma, erect leaves; maximum sugar content, but requiring a rich soil.

The first two varieties, originally from Java, were introduced in 1820 and soon replaced all other canes; the other two varieties were distributed in 1900 by the New Orleans Sugar Experiment Station, which had selected them from a number sent by the Royal Agricultural Society of Demerara. They are distinguished by their high sugar content and by their tillering.

The two first named sugars are either consumed as such, or together with the 96 per cent. sugar are sent to the refineries.

Production. — In average years the yield is about 31 cwt. of sugar per acre on light soils and 21.6 cwt. on heavy soils; in favourable years the yields rise to 48½ and 36.8 cwt. per acre respectively. In dry years the amount of canes harvested is lower, but they are richer in sugar than in wet years.

Cost of production. — The cost of production is much higher in Louisiana than in the other sugar producing countries, being 3.75 cents, (1.84 *d.*), while in Java it is 1.5 cents (0.73*d.*), in the Philippines 1.75 (0.85*d.*) and in Cuba 2 cents (0.98*d.*) per pound of raw sugar. This is due to the light harvests and to the high rate of wages, especially of the managing staff.

This state of things, however, is improving in the sense of a greater division of labour between the sugar cane farmer and the mill owners.

Insect Pests. — Of late years the cane borers have caused much mischief, the loss amounting sometimes to as much as 25 per cent. of the crop. The causes of the increase of these insects lie in the imperfect selection of the seed canes and in the neglect of the advice given by the Louisiana Sugar Cane Experiment Station to burn the infected parts and to destroy *Sorghum vulgare* and *S. halepense*, both of which are host plants of the cane borer.

129 - Sugar Cane Cultivation and Sugar Industry in Peru for 1911 (1).

PAZ, CARLOS ROMERO. Statistics for the Sugar Industry for 1911. — *Peru To-Day*, Vol. IV, No. 8, pp. 424-429. Lima, November 1912.

The Section of Statistics, Direction of Agriculture and Irrigation, Ministry of Fomento and Public Works of Peru, of which the writer is the chief, has compiled the statistics of the sugar industry in Peru for the year 1911. In the present paper the most important data are given, some of them being collected in the form of tables.

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(1) See Nos. 1274 and 1342, *B.* Sept. 1912. *(Ed.)*.

Sugar cane is grown in all parts of Peru where the climate is warm, but its centre of cultivation is in the coast region. This coast region is practically a plain 1400 miles long by 30 or 40 miles wide and is formed by the erosion of the western base of the Andean plateau. Excepting in the extreme north, it is very dry, but it is crossed by some sixty valleys of great fertility.

The rivers which water these valleys bring down enormous quantities of water during the seasons of heavy rains and of melting snows, the greater number of them however almost drying up during the rest of the year. The overflow from these rivers has contributed to the formation of these productive lands, which are of an alkaline character, some of them containing a considerable quantity of chlorides, sulphates and carbonates, soluble in water. The lands where canes are cultivated are generally rich in lime, compared with the cane lands of other countries. Phosphoric acid is everywhere sufficient, as well as potash. There is plenty of nitrogen, but the quantity varies with each section.

Up to the present only three varieties of sugar cane are known in Peru, the white or yellowish white, the greenish yellow and the red or purple. Some foreign varieties have been introduced, one from Demerara and another from Hawaii, but neither seems to be superior to the sugar cane of Peru. The plant diseases are fortunately not very formidable and the only one worthy of the name is known as "barreno" or borer, though it has not yet done any serious damage. In some valleys a caterpillar has been found, which eats the leaves of the plants. Field rats do very slight damage. Among the accidents to which the cane is liable there are : falling down, to which the white variety is especially subject, and early flowering.

The saccharine percentage of Peruvian canes may vary from 17.5 to 12 ; this is due principally to the methods of cultivation. Generally the sugar cane has much fibre, plenty of sugar and slight humidity. The juice is generally good and pure and it is readily manufactured. It is seldom necessary to refine the juices ; the sugars produced are of good colour, and a rather coarse grain, with high polarization and generally of easy crystallisation.

While in many districts from 18 to 24 months are needed for the cane to ripen, in other parts of the coast only 16 months are required. On some lands under favourable conditions, up to 90 tons of cane per acre may be obtained, and in some plantations an average of 60 tons and even more, by intensive cultivation. At the present time the average production in the good plantations is probably from 35 to 45 tons per acre.

The following table gives a general idea of the average quality of the sugar cane of Peru :

Saccharine matter	15.77 per cent
Fibre	15.00 „
Moisture	66.02 „
Density (Beaumé)	11.7
Brix	20.87 per cent.
Pure juice	89.68 „
Saccharine	18.71 „
Sediment	00.47 „
Glucose	00.45 „

Sugar cane was introduced into Peru about the year 1570, and for a long time it was grown on a very small scale. The present sugar industry dates back thirty years. It is located chiefly in the coast region; the production of sugar cane in the *sierra* and *montaña*, which is limited in quantity, is used largely for the manufacture of *chancara* (an alcoholic beverage) and alcohol, which is totally consumed on the spot.

Nearly all the great sugar cane plantations have powerful mills, where they not only grind their own cane but that of neighbouring planters; sometimes they buy the sugar cane from those who have no mills, paying according to the quality and the price of sugar in the great centres, or they grind the cane and receive from 30 to 50 per cent. of the sugar resulting therefrom.

Continuous cutting and grinding are possible in Peru.

The National Tax-Colletion Company furnishes the following data on the sugar industry in Peru in 1911.

Exportation:		
White sugar	91 819	cwt.
Granulated sugar	1 966 030	»
Syrups	374 680	»
Consumption of sugar:		
White sugar	639 644	»
Production of alcohol from cane:		
Cane alcohol	1 361 729	gallons

The data collected and, for alcohol, partly calculated by the writer give somewhat higher figures, namely:

Production of sugar	178 533 tons
„ of alcohol	2 127 070 gallons

Two tables are annexed to the paper; they give the data concerning the production of the various valleys of the coast belt. The following are the totals:

Cane ground	1 285 170 tons
White sugar	22 525 ,
Granulated sugar	105 546 „
Syrups	21 926 „
Chancaca	1 026 „
Alcohol	782 713 gallons
Rum	496 357 „
Number of labourers	16 977
Average daily wages	2s. 4 3/4 d.

130 - Seedling Canes in India.

BARBER, C. A. in *The Agricultural Journal of India*, Vol VII, Part IV, pp. 317-330 + plates XLI-XLVIII. Calcutta, 1912.

After comparing the respective advantages and disadvantages of the "vegetative" and of the "sexual" reproduction of cultivated plants, the writer considers the economical value of the production, by means of seeds, of good varieties of sugar canes, especially of hardy and productive varieties capable of resisting the diseases which are always spreading and becoming more serious, and of holding their own against the competition of sugar beets.

Experiments with the object of obtaining new varieties of sugarcane were carried out in all sugarcane growing countries, especially by the Agricultural Departments in Java, the West Indies, British Guiana, the United States and Mauritius; but it was soon discovered that the great bulk of these seedlings were of inferior character, many apparently reverting to what one might suppose was the original wild form of the plant.

A long labour of selection became necessary. As an instance it may be mentioned that in five years in Barbados some 20 000 seedlings were raised and that less than 1 per cent. of them are likely to prove of ultimate value. In the same time in British Guiana about 330 000 seedling canes were produced, and it is surmised that of the whole number perhaps a dozen may be added to the canes grown in the country.

In Java before 1850 there was practically only one kind of cane grown, the White Cheribon. In that year a planter noted a red cane among the rest: he separated it out and multiplied it. As it proved hardier, more productive and provided with a richer juice, it rapidly replaced the older white cane in many parts of the island. In 1882, however, a planter in the extreme west of Jave noted that his canes were stunted, developed many aerial roots and multitudes of side branches, resembling the curious bunching growth frequently noticed in South India when the canes are irrigated with alkaline water or cropped for several seasons without change of seed. Around Coimbatore this form of growth is known as "shuleh kutteh" and in Java as "sereh" (1). In 1892 this disease had reached the extreme eastern point and entered the island of Bali. It was noted that ratoons were much worse affected than plant canes and that the fields in the hills were comparatively free from the disease. The old plantations were accordingly renewed with seed canes from the hills. It was estimated that in one year alone some £200 000 were lost to the island through the disease, and this when the crisis produced by beet sugar was beginning. In order to solve the difficulty, several scientific sugar stations were founded to study the plant in all its aspects. They imported into Java canes from various countries, among which the Indian variety called Chunnee. A number of these introduced varieties proved to be more resistant to the disease than the local canes, but none were considered completely satisfactory. Recourse was then had to the production of canes by means of seeds, the Indian Chunnee being largely used as a parent; and with good results. Besides being disease-resistant some of the seedlings can resist drought, while others stand excessive moisture; some ripen early and others late, thus continuously supplying fresh canes during the whole of the milling season.

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(1) See p. 361 *B.* Dec. 1910; No. 1541, May 1911. (*Ed.*).

As a result, it may safely be stated that the Java sugar industry is in a very much better position than it was before the appearance of sereh, the output having risen in 1911 to 1230 000 tons, placing Java only second to Cuba among the exporting countries.

The cane sugar industry in India is in an unsatisfactory condition. Most of the better-class canes are heavily diseased or, as in Madras, they are grown on a very small scale, and the hardier and more widely spread varieties are among the poorest in the world.

Consequently the improvement of the sugarcane by means of seedlings has an immediate practical importance. Experiments with this object in view have been made in various localities in India; those carried out at the Samalkota sugar station in the Madras Presidency led to the production (by seeds obtained from the cultivation of imported varieties) of good varieties; none of them, however, are really immune, and hardly any are suitable for introduction into the large areas under cane in Northern India.

The writer has started at the College of Agriculture at Coimbatore the work of breeding and selecting varieties of sugarcane, both local and imported from other parts of India, as well as the histological study of their reproductive organs. The canes flower very freely, but the formation of seed is comparatively rare. The writer has ascertained that this is due to the infertility of the anthers, which often do not open(1). Thus in the varieties Java 36, Java 247, Chin, Desi Saretha and Dhaula Saretha he did ntot find any anthers open. In Striped Mauritius, Red and Green sports from it, Barbados 1529, Fiji B, and Vellai he found from 0.5 to 4 per cent. open, while in Red Mauritius, Cheni and Purple Mauritius the percentage of open anthers rose to 30 to 70 per cent. Of these varieties only one, the Cheni of Mysore, is a native of the country. Perhaps it is the same as the one which, under the name of "Chunnee", was imported into Java from India and extensively used as a parent in the crossing experiments.

Owing to the prevailing infertility of the local canes, there is not much to fear from self-fertilisation, and this facilitates the work of crossing and selection. Both the Cheni and the Red Mauritius are in addition excellent canes in their way, more or less hardy and to a certain extent immune from local diseases; it is expected that they will render good services in the production of new Indian varieties. The writer concludes by reporting upon the present state of the work of selection and botanical classification which he has begun.

(1) See No. 1628, *B.* Dec. 1912. (*Ed.*).

RUBBER, GUM AND RESIN PLANTS

131 - The Nitrogenous Constituent of Para Rubber and its bearing on the Nature of Synthetic Rubber.

BEADLE, CLAYTON and STEVENS, HENRY P. in *Journal of the Society of Chemical Industry*, Vol. XXXI, No. 23, pp. 1099-1103. London, December 16, 1912.

Gladstone and Hibbert were the first to indicate the nitrogenous character of the insoluble part of Para rubbers (those from *Hevea brasiliensis*), which is left as a sort of network after solution of the hydrocarbon (*Journal of Chem. Soc.* 1888, p. 680).

The writers have shown that the insoluble matter derived from Para rubbers of various sources is highly nitrogenous in all cases, and contains up to 7 per cent. of nitrogen, and that the presence of nitrogen in the soluble portion only occurs in rubbers which have received some mechanical treatment; such treatment disintegrates the nitrogenous network.

Results with smoked sheet rubbers have already been given; in this paper those from non-smoked rubbers and rubbers of sources other than *Hevea* are described.

A sheet of plantation rubber was cut into small pieces and allowed to soak in twenty-five times its weight of benzene; after several days the upper layer was carefully decanted and replaced by fresh benzene; after another week or two the clear upper layer was again decanted and added to the first portion and the rubber recovered by spontaneous evaporation: this rubber was of a pale golden colour. The lower portion of the solution, containing the dark nitrogenous insoluble matter, was similarly evaporated, and gave a dark coloured rubber. It therefore appears that most of the colouring matter in dark rubber is due to the insoluble matter. As the dark colour is brought about by the action of oxydases, it is probably the non-caoutchouc constituents which are oxidised rather than the caoutchouc itself.

The following specimens were tested: 1) the rubber not treated; 2) a portion allowed to swell in benzene and then evaporated spontaneously; 3) the lower half of a solution in benzene containing the dark insoluble matter and 4) the upper pale solution.

Analyses of the unvulcanised rubbers.

	1)	2)	3)	4)
Acetone extract per cent. . . .	2.48	2.52	2.32	3.04
Nitrogen per cent	0.475	0.462	0.840	0.070
Calculated as protein	2.97	2.89	5.25	0.44

These samples were masticated and vulcanized under uniform conditions, so as to contain 7 per cent. of sulphur. The sheeted compounds were then cured alongside one another in steam for three hours at 35, 45, 55 and 65 lbs. per sq. in. (exclusive of atmospherie pressure). The second of these cures was ample for vulcanizing 1), 2) and 3); specimens 1) and 4) were submitted to the higher cures to find suitable conditions for vulcanizing 4).

Analyses are given of the vulcanized rubbers as well as a diagram of tests made in the Schwartz hysteresis machine. The breaking strain and elongation were also determined.

Mechanical tests on vulcanised rubbers.

	1)	2)	3)	4)
Cure 3 hours at 35lb. pressure.				
Tensile strength . .	59	53	75	13
Elongation, per cent	910	950	840	710
Cure 3 hours at 45lb. pressure.				
Tensile strength . .	100	100	95	33
Elongation, per cent	740	780	600	1140
Cure 3 hours at 55lb. pressure.				
Tensile strength . .	50	—	—	41
Elongation, per cent	470	—	—	960
Cure 3 hours at 65lb pressure				
Tensile strength . .	40	—	—	30
Elongation, per cent	380	—	—	400

While it is open to question how far the quality of the rubber was improved by the presence of more than a certain proportion of insoluble matter, there would appear to be little doubt that its removal resulted in deterioration. No. 4) is undoubtedly inferior; although 10 or 20 per cent. more distensible than the untreated rubber, its tensile strength (maximum only 40 per cent. of untreated rubber) and other physical qualities were strikingly inferior. Rambong and Ceara appear to behave similarly to Para, although the former contains much less and the latter much more nitrogen.

Obviously synthetic rubber cannot contain any insoluble nitrogenous matter of the character of that found in natural rubber, and to add it so as to obtain the reticulated structure would probably be impossible. It therefore seems reasonable to expect that synthetic rubber would have much the same properties as sample no. 4).

In previous experiments the writers have shown that the removal of the greater part of the resins from such rubbbers as Para grades and Rambong results in a marked deterioration, as shown by the difficulty in vulcanising and the lower figures yielded by the extracted rubbers. It would therefore also be necessary to add resins to synthetic rubber; but the experiments of Seidl show that not all resins have the desired effect, that of jelutong for instance, being useless. Experiments by L. E. Weber (*Journal of the Society of Chemical Industry*, 1912, p. 888) have confirmed the observations of the writers as to the difficulty of vulcanisation after removal of the resins.

132 - Contribution to the Study of Rubber in the North of Madagascar.

HAMET, H. and JOSSE, L.: Contribution à l'étude du caoutchouc dans le Nord de Madagascar. — *L'Agriculture des pays chauds*, 12th Year, Nos. 115 and 116, pp. 265-274 and 372-379. Paris, October and November 1912.

The rubber plants found in the north of Madagascar are numerous. Among Landolphias, *L. madagascariensis* is a liana of considerable length, up to about 100 feet, with a diameter at about 3 feet up of 4 tc 5 inches. Its yield in rubber varies from 6 to 25 per cent. of the latex; the rubber, which is rose-coloured, soon turns brown on exposure to the air; the best yields are those obtained during the warm weather; the best rubber is had by tapping the stem and the adult branches. It is classed among the good average sorts and is worth about 60 per cent. of Para rubber.

Landolphia Perieri gives a rosy-white rubber, full of nerve, very elastic, keeping very well, but the yield is very slight, varying from 4 to 17 per cent. according to the season.

L. sphaerocarpa, called "Reiabo" by the Sakalaves, yields a very abundant latex containing from 18 to 26 per cent. of fine quality rubber. This liana is the most interesting among Landolphias, and in case of plantations the writers are of opinion that it is the one that ought to be multiplied.

"Lombiro" (*Cryptostegia madagascariensis*) yields a good quality latex with a rubber yield of 15 to 20 per cent., and great care is taken to coagulate the latex from the adult branches. It is a kind easy to multiply by cuttings, layering and seeds.

"Bokalahy" (*Marsdenia verrucosa*) yields abundant latex, giving 10 to 12 per cent. of good rubber.

The various species of *Mascarenhasia* are called indiscriminately "Barabangas" by the natives. The rubber produced by these different species is the kind called "Black rubber of Madagascar," and is quoted at 50 to 60 per cent. of the price of Para.

The distribution of these species is described in detail by the writers. "Lombiro" is found all along the coast on the dunes swept by the sea winds; the Landolphias grow under the shelter of the forests and of the edges of the wooded islands forming the great bush; the "Barabangas" seem to adapt themselves to the white quartz sands and cover the banks of water courses and grow even in the beds of torrents. All these various rubber lianas are endangered by bush fires and by the violence of the waters; it would therefore be necessary to delimitate the areas which are suitable to the production of rubber and a good deal would have to be done to induce the natives to produce a better prepared rubber of a more constant quality.

The high value of plantation products is due especially to their state of purity; it is therefore necessary to increase the production and the value of Madagascar rubber. It is for this reason that the writers have very attentively followed the various operations that the natives carry out for extracting rubber, and they have led them to intruduce, under their surveillance, some modifications in their special technique, especially with a view of making them:

1) Free the latex from the impurities it may contain.
2) Treat it immediately upon its extraction from the plant.
3) Disinfect it preliminarily, to ensure its preservation.
4) Use a coagulent to the required degree of acidity.
5) Filter the coagulant.
6) Use an excess of coagulant in the latex.

Samples of rubber thus prepared by the natives were submitted to the judgment of experts at Havre and Antwerp.

The following are the results of the comparison of the above rubbers with Ceara plantation rubber, Java, Manihot and Ceylon Para.

	I Lombiro — per cent.	II Landolphia — per cent.	III Ceara — per cent.	IV Manihot — per cent.	V Ceylon — per cent.
Moisture	1.2	1.8	1.2	0.8	0.3
Ash	0.5	0.15	0.7	1.2	0.4
Resin	8.75	7.2	7.7	5.2	2.95
Resistance to heat: 10 hours at 70° C.	well preserved	well preserved	fairly well preserved	well preserved	fairly well preserved

The qualities I and II can thus bear comparison with the finest sorts of second rate rubbers.

The writers explained also to the natives that they allowed an appreciable quantity of rubber to be lost by abandoning the branches that are cut, and that by barking and pounding them, 100 lbs. of abandoned branches would yield 8 lbs. of rubber similar to the fine sorts called "Benguelas" and also "Mozambiques."

This system of extraction, which, in order to be productive, should be carried out by machinery, offers the great advantage of allowing the treatment of branches that would otherwise be wasted, of plants with very thin stems and of those slow growing kinds for which this method is more advantageous than tapping.

In order to ensure the future of Madagascar from the point of view of the production of rubber, the first thing to be done is to stop the devastation and destruction of the spontaneous indigenous stands, and to increase the production of the country; the existing species should be multiplied or the best American kinds should be introduced, as they have been in Malaysia. The latter solution seems the best, for whilst Heveas for instance, could give as much as 267, 357 and even 410 lbs. per acre, with lianas, calculating on 400 plants per acre, one could not have more than 107 to 116 lbs. per acre at the utmost. But the fact must be borne in mind that the experiments made of transplanting Heveas as well as Cearas and Castilloas have not yet given conclusive results and that on the other hand the development of a plantation of indigenous rubber-bearing species in Madagascar seems likely to give good results.

133 - **Rubber Examined at the Imperial Institute** (1).

1. — Rubber from Ceylon.
2. — Rubber from Papua.
3. — Rubber of *Hevea confusa* from British Guiana.

Bulletin of the Imperial Institute, Vol. X, No. 3, pp. 380-383; 386-388; 388-389. London, 1912.

1. *Ceylon Rubber.* — At the Experiment Station at Peradeniya, Ceylon, a series of tapping experiments was carried out to determine the relative value of excision and incision methods as applied to *Hevea brasiliensis*, the tapping being performed 1) by the knife only (incision), 2) by the pricker only (incision) and 3) by a combined method using both knife and pricker. The results of the chemical examination of the rubber, which was analysed at the Imperial Institute, proved that the different methods were nearly equal. Two specimens obtained by making V and half-spiral incisions were practically identical, though the crêpe resulting from the third method was a little inferior to that obtained by the first two. The biscuit obtained by the third method was a little superior to that due to the first.

In 1906, several new rubber-yielding species of Manihot (*M. dichotoma*, *M. heptaphylla*, and *M. piauhyensis*) were discovered in Brazil and were stated to be superior to *M. Glaziovii* and therefore introduced experimentally into a number of countries. In Ceylon, *M. dichotoma* is stated to thrive better than the Ceara tree (*M. Glaziovii*). Samples of rubber from young trees of the first species were prepared at the Experiment Station at Peradeniya and analysed at the Imperial Institute; the rubber in composition was of very fair quality (84.6 per cent. of caoutchouc), although the percentages of protein (5.7), insoluble matter (4.3) and ash (2.9) were rather high.

2. *Rubber from Papua.* — The chief rubber-yielding plants indigenous to Papua are *Ficus Rigo* and a species of vine, which has so far not been determined. *F. Rigo* is a tree, which is chiefly found in the Rigo district, where it is known by the natives as "Maki;" it furnishes rubber of good quality, which is collected by the natives for export. Experimental plantations of the tree have been formed in the island. The rubber yielded by the vine is also of very fair quality.

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(1) For further information on this subject see also: *Colonial Reports, Miscellaneous, No. 82. Imperial Institute. Selected Reports from the Scientific and Technical Department: IV, Rubber and Gutta Percha.* London, 1912. *(Ed.).*

3. *Rubber of* Hevea confusa *from British Guiana.* — *Hevea brasiliensis* is not indigenous to British Guiana, but it has been introduced for plantation purposes and promises to do well in the Colony. Several other species of *Hevea* are, however, natives of the above-mentioned country, and of these the most widely distributed is *H. confusa* (Hattie or Sibi). The rubber furnished by this plant has hitherto been regarded as of little commercial value, but the present sample, which has been analysed at the Imperial Institute, though deficient in elasticity and tenacity, is of very satisfactory composition.

Caoutchouc	92.3	%
Resin	1.8	„
Protein	4.9	„
Ash	1.0	„

The yield per tree is small, even under cultivation (British Guiana, Jamaica, Java). At Buitenzorg, twenty-year-old trees, with a girth of from 40 to 50 inches breast high yielded only 0.35 oz. of dry rubber per tree.

134 - The Cultivation of Cigar Tobacco with Special Reference to Java.

VARIOUS CROPS.

The Bulletin of the Imperial Institute, Vol. X, Nos. 2 and 3, pp. 148-263 and 465-470, London, 1912.

The United Kingdom imported in 1910 no less than 111 257 544 lbs. of unmanufactured tobacco, valued at £3 435 493, of which only 1 471 102 lbs., valued at £45 987, was derived from British sources (almost exclusively British North Borneo, India and Jamaica). The writer is of opinion that it would be desirable to extend the growing of tobacco in the British colonies; he considers the question under its various aspects and as a contribution to its solution he gives an account of cigar tobacco cultivation and preparation as it is carried on in Java.

All the tobacco estates in Java are situated in the Vorstenlanden or Principalities (of Djocjokarta and Soerakarta or Solo) and are mostly situated near Klaten in the principality of Soerakarta. The chief estates subscribe a definite sum per annum to the Department of Agriculture for the upkeep of the Tobacco Experimental Station at Wedi or of the General Experimental Station of Salatiga, which includes a special tobacco section with a laboratory at Klaten.

Land Tenure and Labour. — In the Vorstenlanden all the land is looked upon as belonging to the native prince, and one-fifth of it is regarded as appertaining to him personally. A portion is employed to meet the administrative and other expenses of the principality, the rest is allocated to the use of the royal family, court officials, etc. Part of the land has been let to the tobacco undertakings, nearly all European, usually on long leases, with certain rights to the labour of the natives who live on the land. One-fifth of the land let to a tobacco undertaking is at the disposal of the "Bekel," the intermediary through whom the land is leased, and he may either cultivate the land himself, or re-let it to the planting company. The remaining four-fifths of the land is divided into two parts, one of which is planted for the company by the peasants, and the other is reserved to the peasants on the estate, for their own cultivation. The two parts are interchanged annually so that the benefits of a rotation of at least one crop, usually rice, with the tobacco are obtained.

The services the peasant must perform on the land which he cultivates include the preparation of the soil, the preparation and care of the seed beds, the planting out of the tobacco seedlings, the care of the growing tobacco and its irrigation. The estate lessees provide and pay specially for the transport and application of manure, the construction of large drains, deep tillage, the harvesting and transport of the tobacco crop, and for the curing, fermentation and grading of the tobacco. The rates of pay for coolies are about one shilling a day.

Climate. — The tobacco season in Java lasts from March to December. The plants complete their growth in about 2½ months. The climate is moist throughout the whole year, though there is a relatively dry season from June to October. The temperature is nearly uniform, rarely inferior to 20° C. or superior to 35° C., with variations of the monthly mean temperatures of only one or two degrees.

Soil. — The upper layers of the soil are composed almost exclusively of very fine sand and clay of volcanic origin. This material is composed essentially of andesite, which contains from 0.5 to 1.34 per cent. of potash. The soils at the foot of the volcano Merapi contain 0.05 to 0.10 per cent. of total nitrogen, 0.01 to 0.17 per cent. of phosphoric acid and 0.04 to 0.12 per cent. of potash; they are all the richer in phosphoric acid and potash the nearer they are to the volcano.

Cultivation. — Leguminous crops are grown on the land for several years before it is used for tobacco. After a certain time sugar-cane follows tobacco. At the end of December, when the tobacco has been harvested, dams are erected round the field and the latter is flooded for rice cultivation. The rice has been sown in seed beds forty or fifty days previously and the young plants are transferred to the field. About a hundred days later the rice is ripe and ready for cutting (January to May). The land is then harrowed twice, ploughed and again planted out with rice, and after another hundred days (June to October) these operations are repeated for a third crop of rice (November to March). So that three crops of rice are obtained between each two tobacco crops. The average yield per crop of rice is 7228 lbs. per acre (100 piculs per bouw), and of tobacco 1445 lbs. (20 piculs per bouw). Where there is not enough water to permit of rice cultivation, maize, soy beans, ground nuts, or "dry rice" are grown between the tobacco crops. Water being very important in tobacco cultivation, a system of reservoirs, canals, etc., has been constructed with a view to conserving and using the supply.

Preparation of Soil. — After the third harvest the rice straw is removed and used partly as buffalo fodder and partly as fuel for sterilising the seed-beds. The chief gutters are then dug out (150 ft. apart, about

1 ½ ft. wide and 4 ft. deep); they are generally made in a new place every year; the land is then ploughed and manured and ploughed again twice, after which a second system of parallel gutters is constructed. These are about 10 in. wide and 1 to 2 ft. deep and lie about 30 ft. apart, running at right angles to the first set, which is made in the direction of the slope of the land. The whole field is then surrounded by a ring-drain. The plots thus formed are ploughed again three times. The land is then marked out for planting, pieces of split bamboo indicating the positions the tobacco seedlings are to occupy, at intervals of 1 ft. 6 in. along rows 3 ft. apart.

At this stage the middle two feet of the three-foot space is worked by the patjol (a kind of broad mattock) to a depth of 1 ¼ to 1 ½ ft.; the remaining 6 in. on either side of the bamboo marks is worked to a depth of 9 in., except close to the bamboos, in order to allow the young plants to root more firmly. Another method of working the soil consists in breaking it up in strips and leaving the subsoil of each alternate strip exposed to the air for some time. Whichever method is adopted, on the whole the working of the soil is done with great care.

Manuring. — Practically the only manure used is street sweepings (rather poor) and the rice straw that is ploughed in. Green manuring would be advantageous, but it cannot be carried out economically as the fields are already occupied almost continuously by rice or tobacco. The tobacco crop refuse is not used as manure because the commendable practise obtains of burning all this refuse every year to avoid spreading plant diseases.

Seed Beds. — The seed beds are prepared in mid-July, end of July and mid-August, so as to have tobacco in three stages of development. The soil selected for seed beds is ploughed several times and worked over by hand, exposing it as much possible to light and air as a means of avoiding "mosaic" disease. The beds are made 12 ft. long by 4 ft. wide and 1 ft. high, and are provided with drainage and irrigation ditches. Water is supplied in them during the first five days to flood the seed beds and destroy ants. Three days before the seed is sown rice straw is spread on the beds and after it has lain one day to attract insects it is burnt Around each bed a bamboo framework is made, on which mats can be placed to afford shade when necessary.

The beds are well smoothed over and flattened, and the seed sown at the rate of 0.5 gram per bed; for the first five days the beds are watered; after eight days thinning out begins. As a rule 3000 plants are raised on each bed, or about 60 per square foot. Some consider this too high and recommend 20 per square foot. Beginning on the sixth day the beds are sprayed with Bordeaux mixture every five days. On the twelfth day the shade is removed during the cooler parts of the day, and from this time onwards the duration of shading is reduced each day, and by the thirtieth day the plants should be ready to do without any shade and the covers are not replaced unless heavy rain falls.

The young plants are planted out in about thirty-five to forty days after sowing, on thoroughly watered ground, and are watered daily for the first seven days.

The rest of the cultivation consists in breaking up the soil round the plants whenever it becomes hard, in heaping soil round the bases of the stems, in removing and burning weak or diseased plants and replacing them.

Harvesting. — In general the tobacco is not topped, nor are the suckers removed. The leaves are picked singly in the early morning, when they are poorest in starch, beginning with the bottom leaves. As a rule eight bottom leaves, ten middle and six top leaves are obtained, the three kinds being kept separate also in all the successive operations. The leaves are then hung up to dry in the drying sheds, which are fairly well ventilated, but which are allowed the least possible amount of light.

The dry leaves are made up into bundles of fifty to fifty-five leaves each, and placed to ferment in rectangular heaps of twenty layers, each consisting of about 500 bundles. After about five days the temperature rises to 60° C. The heaps are then unpacked and with the contents of every two of them a new heap is made containing forty layers. This unpacking of the heaps when their temperature rises to 60° C. and remaking of larger ones, is repeated usually three more times, thus five in all, care being always taken to place the bundles that were on the outside of the previous heap in the middle of the new one.

Grading. — The sorting of the leaves is done first according to quality, and then according to colour. Six classes are made: 1) complete thin leaves of good texture and free from stains; 2) as above, but showing fungoid disease stains; 3) broken leaves, subdivided into four qualities; 4) leaves showing pressure marks; 5) leaves showing spots; 6) thick leaves.

The graded tobacco is made into "hands" consisting of 30 to 40 leaves and the hands are packed under pressure into bales of about 176 lbs. in weight. The tobacco is shipped from Semarang to Amsterdam.

The yield of finished tobacco is about 1260 lbs. per acre, and the average price is about 1 shilling per pound.

Diseases and Pests. — Throughout, a very careful watch is kept for insect pests, and the village children are paid to collect and destroy them. *Phytophthora nicotianae* is very prevalent. The diseased plants are uprooted and burnt, and the holes are filled with a mixture of lime and ammonium sulphate solution. The surrounding plants are sprayed with Bordeaux mixture. After four days, if no further outbreak has occurred a new plant may be inserted in the gap.

Another disease which has proved troublesome is a bacterial disease which attacks the roots in soil newly cultivated, or which has not been worked so intensively as usual, or in which acid fermentation is proceeding. Besides the above, mosaic leaf disease is widespread, but on the whole does very little harm.

135 - The Fuller's Teasel.

DALLIMORE, W.: *Royal Botanical Gardens Kew. Bulletin of Miscellaneous Information*, No. 7, pp. 345-350. London, 1912.

This article is the result of a request received at Kew from a firm at Leeds respecting the increasing difficulty of obtaining a regular supply of teasels, and it also gives bibliographical notices concerning the cultivation of this plant in Great Britain and the United States.

It has not been found possible to construct a machine capable of giving the same finish to cloth as is obtained by the use of the teasel.

In commerce, these heads are known by different names: "king teasel" (the central head, which terminates the main axis and is always the largest); "queens" (found at the ends of the principal branches); "princes," or "buttons" (borne by minor branches). One English firm sorts the teasel heads into 70 different sizes previous to selling them to its customers.

France has perhaps the largest acreage under teasels, and French-grown heads fetch the highest prices, but this plant is also cultivated in England, the United States and Germany.

In England, land is hired from farmers by Messrs. North for the cultivation of one crop at the rate of £6 per acre per year. Ground which will produce good wheat is considered most suitable for teasels and, when possible, a crop of wheat is followed by teasels, the soil being well worked, but not manured. Seeds are drilled into the ground in March of one year for the succeeding year's crop. The ground is weeded in June and again in July, when the plants are thinned out. In October, a further cleaning of the ground and loosening of the soil takes place.

Next year, in March, the ground is loosened and the plants finally thinned, being left about three feet apart each way; any gaps caused by death through damp or frost in winter are filled up. In June and July (the flowering season) a strict watch is kept in view of a possible attack by caterpillars. The harvest takes place in August and September. The heads are dried in sheds with open sides and thatched roofs, which are erected in the fields. The heads mature at different periods, so the plants have to be gone over several times. They are cut with about six inches of stalk, tied up in handfuls, threaded on long poles, and hung in the sheds for about five weeks to dry. They are then taken into a barn, sorted, and tied up into bundles for sale. The price of a bundle varies from 35*s.* to £24. The annual value of the heads used in England is estimated at about £15 000; while the value of teasels imported in 1911 from France was £8 681, from Germany £295 and from the United States £349.

Regarding teasel culture in England, there appear to be two critical periods: one is during winter, when many plants are killed by the inclement weather, and the other is during the harvest, when a period of wet weather may wholly or partially ruin the crop. On account of this, indoor cultivation has been suggested. An experiment in this direction has been made, but not on a sufficiently large scale to permit of an opinion being formed as to the financial result. In the absence of experience, one would be inclined to consider that such a scheme would be a financial failure, for the gross average income from an acre of teasels is about £70 and this after the ground has been occupied for 18 months, while the necessary expenses of building portable houses, soil renewal, etc., would be very heavy.

There appears good reason to suppose that better results might be obtained by moving the cultural area from Yorkshire and the western counties to Essex and Hertfordshire and perhaps Norfolk and Suffolk. Experiments might be conducted with a view to obtaining a race which would stand the winter well and mature earlier. Seeds should be selected from well grown heads. Experiments ought also to be made in order to save the ground for one summer by sowing seeds thinly on a small area of ground; a crop of wheat could be taken from the rest and the teasels planted out in autumn.

Cultivation in France. — In France, the plant is found to thrive best in a light, gravelly soil with a southern aspect. The seeds are sown in spring and the young plants well thinned out. In August, they are transplanted into rows about 12 to 15 inches apart and are kept well weeded during the winter. Sometimes the teasels are sown in the places where they are to remain and a cereal is grown with them, so that a return may be obtained from the ground during the first year. In the following spring, as soon as the plants have attained a height of from 20 to 24 inches, a number of the side shoots are removed, eight or twelve being left for each plant. Harvesting is commenced when the leaves begin to fall or to turn yellow. When dry, the heads are packed in boxes containing from 25 to 100 each, all of uniform size and colour. In 1909, 3690 acres of teasels were grown in the three districts of Bouches-du-Rhône, Vaucluse and Seine-et-Oise, and the 40 380 cwt. of heads produced were valued at £51 237.

Cultivation in the United States. — In America, it is usual to sow the seeds in drills 3 to 3½ ft. apart with a thin crop of corn. The grain is gathered and the straw left standing to afford protection fom snow during winter. The plants are eventually thinned to eight or ten inches apart in the rows, and harvesting takes place in a similar manner to that adopted in England. The average crop is 100 000 heads per acre (about the same as in England), and the medium price in New York is from 90 cents to one dollar a thousand, though it may drop to 50 cents, or rise to two dollars. One thousand heads are said to weigh ten pounds. Teasel growing forms a local, but important, industry in the States of New York (Onondaga County) and Oregon (Clackamas County).

The cost of growing there is given as twopence a pound for dried heads and the selling price as four pence a pound.

136 - Fruit and Vegetables in Alaska.

MARKET GARDENING

U. S. Department of Agriculture, Annual Report of Alaska Agricultural Experiment Stations for 1911. Washington, 1912.

At the Sitka Experimental Station a hardy strawberry has been produced by crossing the cultivated variety with a wild native Alaskan plant. The new variety appears to be well adapted to the climatic conditions of that region, and gives far better yields than either of its parents.

In the apple orchard, planted in 1903, ripe fruit was produced for the first time in 1911, possibly owing to the exceptionally fine weather during September and early October of that year. The fruiting varieties were all of crab descent.

Cherry and plum trees continue to prove unsuitable to the prevailing conditions ; but currants, raspberries and gooseberries do well and are represented by a number of varieties.

With regard to vegetables : variety trials of potatoes, cabbages, cauliflowers, lettuces and radishes were continued ; the results show that good crops, with regard to both quality and quantity, may be obtained not only in the coastal region of Sitka but also at the interior stations of Rampart and Fairbanks.

137 - The Passion Fruit in New South Wales.

FRUIT-GROWING

ALLEN, W. J. in *The Agricultural Gazette of New South Wales*, Vol. XXIII, Part 11, pp. 975-979. Sydney, November 2, 1912.

The passion vine flourishes on many classes of soils (some extremely poor), and has been found specially useful for interplanting in young citrus plantations in the Cumberland, Penang Mountain and Gosford districts (N. S. W.). Plants may be raised from seed sown in February and the vines planted out in August or September in rows 10 ft. by 12 ft. apart. The young vine is trained up a stake with a single stem to a height of about 5 feet ; then it is allowed to throw out two to four leaders, which are made to run either way along two horizontal wires about 6 in. apart. In the second year after planting, two good crops of fruit are obtained — summer and winter — and by pruning away the summer crop when halfgrown, a large yield is obtained in winter when other fruits are scarce. The yield is maintained for about four years, after which the plants should be grubbed. The vineyards will never succeed in regions exposed to frost, and the land should be limed if necessary and generously treated with fertilizers to obtain good results. The fruit is of remarkably fine flavour, and keeps well in a cool, dry place.

138 - Investigations and Researches Regarding the Effects Produced on the Vine by Grafting.

1. VIALA, P. and PACOTTET, P. Notes et recherches sur l'influence du greffage. — *Revue de Viticulture*, Vols. XXXVI, XXXVII and XXXVIII, Nos. 940-944, 946, 976, 978, 980 and 982, pp. 685-690, 5-7, 33-37, 65-70, 141-144, 233-237, 293-298, 405-411 and 511-517. Paris, December 21, 1911 ; January 4, 11 and 18, February 1, August 29, September 12 and 26, October 10 and 31, 1912.
2. VERDIÉ. Enquête sur les effets du greffage. — *Bulletin de la Société des Agriculteurs de France*, pp. 362-373, and 423-428. Paris, December 1 and 15, 1912.

1. — The theories which have been promulgated during the last few years respecting the reciprocal influence of stock and graft have in no wise modified the practice of reconstituting vineyards by planting them with American vines resistant to phylloxera. Nevertheless, the importance which recent scientific work seems to attach to questions of the reciprocal action of stock and graft was not unknown to vine-growers.

Vine-growers have always been a little afraid as to the effect grafting might have on their vines and the quality of the wines, and all the more since reconstitution with American vines has made grafting general.

The writers, like other vine-growers, have for a number of years made observations in the vineyards as to the influence exerted by the different stocks on the various grafts. These observations have been controlled in a comparative and more scientific manner, by experiments in the different experimental plots set apart for this purpose.

The following is a short summary of their important studies:

"Observations and experiments made in the vineyard and continuously in the experiment field, not for two or three years alone, but extending over a period of fifteen years, show that the variations thought to be due to grafting do not exist and have never existed.

"The numerous facts which we have ascertained by means of comparative observations in the course of this work, have also shown that the characters and qualities of high-class and of ordinary wines are retained or improved by grafting French or European varieties on American stocks."

2. — In 1908, the "Société des Agriculteurs de France" appointed a Commission of Enquiry regarding grafting and its consequences. The work of this Commission was the centralization of the greatest possible number of documents and the control on the spot of the facts collected.

They began by drawing up a question schedule, which was sent throughout France to viticultural syndicates, associations and societies, as well as to the chief vine-growers, for the purpose of collecting all the opinions and known facts for or against grafting. In March 1909, the replies to these questions were divided as follows:

Two hundred and twenty-nine were in favour of grafting.

One hundred and sixty-nine answers were to the effect that there was no difference between grafted and non-grafted vines.

Twenty replies stated that grafted vines were more liable to their grapes running off.

Ten replies testified to the diminuution of resistance to fungus diseases, *i. e.* of defects which are corrected by pruning or staking.

Nine answers mentioned that the wines from these vines were inferior in quality.

Thus, only nine out of four hundred and thirty-seven answers were unfavourable to grafting, as far as the quality of the vines was concerned. It was thus necessary that the facts which had given rise to the most contradictory opinions should be verified on the spot.

The delegation entrusted with this duty made its first tour in the south-west and south, from the 8th to the 22nd of August 1909, and came to the following conclusions:

" From the data collected, it is clearly seen that the objections made to grafting are not sufficiently well-grounded to prove any degeneration or specific modifications due to this practice, as usually effected; provided the requisite conditions of affinity and adaptation are present and that the other vital necessities of the vine are not neglected."

The Commission proposed continuing its studies during the course of the summer of 1910, in Burgundy, Champagne and Franche-Comté, but was prevented owing to the very unfavourable weather. But from the information received from these regions, and which came from absolutely reliable sources, it appears that no facts were discovered which in any way made it necessary to modify the above- mentioned conclusions.

The Commission therefore proposed to the Viticultural Section of the Society that the enquiry should be suspended for the present.

139 - Manuring Vineyards with Tobacco Refuse in Hungary.

RASZO, IMRE.: Szolotrágyázás dohányhulladék trágyával. — *Borászati Lapok*, Year 44, Nos. 50 and 51, pp 778-780 and 796-797. Budapest, December 8 and 14, 1912.

This is a study and discussion of the problem of manuring vineyards with tobacco refuse according to the experiments made in 1912 in the vineyards of Count Batthány at Szabadbattyán.

This problem is interesting, as the question of manuring becomes always more urgent in the sandy vineyards of Hungary, where, owing to the insufficient quantity of stable manure, it is sought to introduce other manures rich in organic matter, such as dried pigs' dung and town refuse, the use of which however is more costly than that of tobacco refuse.

The vineyards in which the experiments were carried out were divided into five groups, each of which contained five plots of 1712 square yards each. All of them, save two, were planted with Riesling grapes. Between the rows of vines furrows about 14 inches deep were opened, in which the tobacco refuse, completed by artificials, was placed. The manures were applied in three different doses: medium, heavy and very heavy.

In order to compare the effect and the duration of the phosphatic manures, superphosphates and basic slag were used, the latter also in order to study the effect of the lime it contains on the decomposition of the tobacco refuse. The quantities of manures to be applied were calculated on the basis of the composition of the tobacco refuse and on that of the quantity of pigs' dung usually employed. The composition of these two manures is shown by the following table (next page).

Tobacco refuse thus contains less phosphoric acid than the dried pigs' dung, but more organic matter, nitrogen and potash.

The year 1912 did not prove very favourable to the vine, so that the result of the experiments was not so favourable as was expected.

TABLE I

	Water per cent.	Organic matter per cent.	Nitrogen per cent.	Phosphoric acid per cent.	Potash per cent.
Tobacco refuse	10	60	2.3	0.4	2.5
Dired pigs' dung.	13	56	1.9	2.2	1.5

Nevertheless it shows that tobacco refuse is useful for the vine, especially as a source of humus; it is particularly suitable, with a complement of phosphatic and potassic manures, for sandy soils where vegetation is vigorous.

The writer recommends the following quantities per acre per annum for four years, which are not excessive.

1st year: 6154 lbs. of tobacco refuse, 309 lbs. of superphosphate and 112 lbs. of 40 per cent. potash salts.

2nd year: no manure.

3rd year: 243 lbs. of superphosphate, 112 lbs. of 40 per cent. potash salts and 93 lbs. of sulphate of ammonia.

4th year: 61 lbs. of sulphate of ammonia.

The writer is of opinion that in cases when farmyard manure is scarce, tobacco refuse, owing to its high content in organic matter and to its even action, is one of the most economical and useful manures, especially in the sandy mountain vineyards.

140 - Irrigation of Olives and Its Effects.

SOMMA, U. L'irrigazione all'olivo e sua azione. — *Le Stazioni sperimentali agrarie italiane*, Vol. XLV, Part 12, pp. 930-939. Modena, 1912.

Experiments carried out at Bari, upon old trees in full bearing, on light, permeable soil (calcareous tufa) irrigated with slightly brackish water twice, at the beginning of June and the beginning of August, by means of a basin of 10 ft. radius round the trunk of the tree, containing 135 gals. of water. Fertilizer per tree: 66 lbs. of stable manure, 2¼ lbs. of mineral superphosphate, 2¼ lbs. of sulphate of ammonia, 1 lb. of sulphate of potash.

Average per tree. From observations made during the four years 1909-1912.

Leaves and branches removed in pruning	lbs. 41.4	31.2
Olive crop	lbs. 87.8	64.5
Average weight of 1 gal. of olives	6 lbs. 5oz.	6lbs. 7oz.
Olives per gallon	1668	1782
Proportion of kernels to pulp, per cent.	17.4	18.6
Percentage of water in fresh olives	42.217	41.947
Percentage of dry matter in fresh olives (at 105°C.)	57.783	58.053
Percentage of fat (ether extract) in fresh olives	23.295	22.990
Oil from 100 fresh olives	gr. 38.809	37.598

Conclusions. — 1) Irrigation promotes the development of the foliage of the tree: thus vigorous pruning is necessary. 2) The proportion between the leaves and the wood removed by pruning gives a larger percentage of leaves in the case of irrigated trees (up to 23 % compared with 18.5 % in non-irrigated). 3) Irrigation promotes a larger crop of fruit (average 21.4 lbs. per tree per annum). 4) There is less falling of the flowers, because the growth is more regular. 5) The olives are larger and heavier; their water content is a little increased, but at the same time the amount of oil present is always a little larger.

As a whole, the experiment showed that it would be most advantageous to introduce irrigation of the olive into Apulia. If fresh water were used, the results would possibly be still more satisfactory.

141 - The Uses of *Roystonea regia.*

Los Usos Economicos de la Palma Real — *La Hacienda,* Vol. VIII, No. III, pp. 91-93 + figs. Buffalo, N. Y., December 1912.

The royal palm (*Roystonea regia* Cook) grows wild throughout the Antilles and also in South Florida, Mexico, Central America, and in the northern part of South America. It is especially abundant on damp fertile soil, such as is suitable for tobacco cultivation. In the west of Cuba it is found on land which was formerly cultivated, but has since been abandoned. The trunk is often 70 to 85 ft. high, with a diameter of at times as much as 24 inches. The wood is considered unsuitable for constructive purposes, but the external layer of hard wood is much used for walking sticks, sticks. stakes, fences, posts, tables, coffee mortars, gutters, and the partition walls of houses. The most useful portion is the "yagua," a kind of coriaceous bark. The large terminal leaves have long amplexicaul petioles 4 to 9 ft. long and as wide as the circumference of the stem. Every three or four weeks, a leaf falls; this is damped, flattened by means of weights, and dried. The dried petioles are sold per truss and provide the best packing material for export tobacco. The leaf-bases supply a fibre from which ropes and string are made. In Cuba, "yagua" is also used in the construction of the poorest houses. The terminal bud is edible, but its removal causes the death of the tree. *R. regia* is one of the most elegant palms for planting in avenues.

142 - The Scientific Application of Fertilizers to Trees when Planted Out.

WAGNER, J. PH. (Prof. of Agric. at Ettelbruck, Luxemburg.). Application rationnelle des Engrais aux Arbres à planter. Communication à la Société Nationale d'Agriculture de France. — *Le Progrès Agricole et Viticole,* Year 33, No. 51, pp. 793-795. Villefranche (Rhône), December 22, 1912.

The application of fertilizers to trees in general, and to young trees when they are planted out in particular, is, according to the writer, a very vexed question.

He considers the following three points:

a) The situation of the roots of the tree in the soil.
b) The nature of the young tree, its susceptibility to fungus diseases.
c) The method of action of different fertilizers.

An account is given of the following method. The chemical fertilizers (phospho-potassic) are well mixed with the superficial soil, which is to be put first of all in the trench; then comes a layer of ordinary soil 8 to 12 inches deep, next the nitrogenous fertilizer, if this is used (nitrate of soda, sulphate of ammonia, guano, etc.), and finally, the last layer of soil to fill up the trench.

The soluble nitrogen in nitrogenous fertilizers finds its way gradually to the roots; thus a nitrogenous fertilizer of a very caustic nature is no longer in direct contact with the roots where it might be harmful.

The organic manures are placed in an intermediate layer, neither too deep nor too superficial, and without being in direct contact with the roots they do not incur any risk of loss or of drying up; they are besides rendered powerless as propagators of fungus diseases.

The phosphoric acid and potash contained in less mobile artificial fertilizers are directly within reach of the roots and can be absorbed as they become capable of assimilation.

The writer adds that is is well to give the young tree for about three years, in some form or other: 25-30 gr. (about 1 oz.) of nitrogen, 30-40 gr. (1 to 1¼oz.) of phosphoric acid, 40-45 gr. (about 1½ oz.) of potash, 25-30 gr. (about 1 oz.) of lime, which about corresponds to: 7 oz. of nitrate of soda, 7 to 9 oz. of basic slag, or the corresponding weight of superphosphate, and 3 oz. of potassium chloride. If the soil is not too poor in lime, the lime contained in the slag suffices. The fertilizers, in the amounts calculated for three years, should be applied on the surface, and at the end of this time should be dug in as deep as possible, so that they may reach the roots.

143 - Forest Fires in the United States: Their Causes, Extent and Control.

1. Plummer, Fred. G.: Forest Fires: Their Causes, Extent, and Effects, with a Summary of Recorded Destruction and Loss. — *U. S. Department of Agriculture, Forest Service, Bulletin* 117, pp. 39 + figs. 6 + plate 1. Washington, 1912.

2. Peters, J. G.: Forest Fire Protection under the Weeks Law in Co-operation with States. — *U. S. Department of Agriculture, Forest Service, Circular* 205, pp. 15 + plan 1. Washington, 1912.

3. Graves, H. S.: Protection of Forests from Fires. — *U. S. Department of Agriculture, Forest Service, Bulletin* 82, pp. 48 + fig. 1 + plates X. Washington, 1912.

4. Adams, D. W.: Methods and Apparatus for the Prevention and Control of Forest Fires, as Exemplified on the Arkansas National Forests. — *U. S. Department of Agriculture, Forest Service, Bulletin* 113, pp. 27 + figs. 8 + plates VI. Washington, 1912.

FORESTRY

5. Silcox, F. H.: Fire Prevention and Control on the National Forests. — *Yearbook of the United States Department of Agriculture*, 1910, pp. 415-424 + plates XXVII-XXXII. Washington, 1911.

1. — Forest fires in the United States have caused an average annual loss of about 70 human lives, the destruction of trees worth at the very least $25 000 000, and the loss of stock, crops, buildings, and other improvements to the amount of many millions more. To these must be added enormous losses from the destruction of young tree growth, deter-

ioration of the soil, damage to water courses and adjacent property by low water and flood, interruption of business, and depreciation of property. By an inquiry into the causes and extent of such fires we are able to realize in some degree the magnitude of these losses.

The first compilation of forest-fire statistics for the whole United States was by Prof. C. S. Sargent for 1880, published in the Tenth Census Report, Vol. IX,. In 1891 the Division of Forestry of the Department of Agriculture collected statistics of forest, prairie, and crop fires. The Chronicle Fire Tables for the year 1900 report a loss of $2 246 000 from forest fires, compiled by insurance companies. In 1900 and 1901 the Division of Forestry made a second attempt to gather statistics upon which damage from forest fires might be estimated. New data have been obtained from: (*a*) reports of fires on National Forests; (*b*) reports of State foresters from 17 States; (*c*) supplemental reports of forest supervisors of fires outside the National Forests; (*d*) reports of lumbermen's associations; (*e*) newspaper accounts from press-clipping bureaus of recent fires; (*f*) the Forest Atlas (this is the central map system of the Forest Service and contains manuscript maps); (*g*) investigations of Forest officers, particularly in even-aged forests, to determine by stem analysis the dates of old burns. Before this mass of material could be used the record of each event was reduced to a common standard, and a card system was devised, as shown below:

Sample of U. S. Forest Service fire record.

Kind of fire: Forest - Brush Land - Prairie (Check Mark Proper Term).

Location of Fire	State, ... County, ... Near	Date of Fire	Year, ... Month, ... Day (or Days), ...

Origin of fire, ...

Area burned, ... Timber burned, ... board feet.

Value of timber burned, ... Value of other property burned, ...

Number of buildings burned: . . . houses, . . . barns, . . . mills, and . . . others.

Number of lives lost, . . . Number stock lost: . . . cattle, . . . horses, . . . sheep.

Remarks: . . . .

The above information is furnished by . . . .

Date, ...

As the value of a fire record depends upon the field report, it is necessary that there should be a uniform method of assigning the causes of fires. The following scheme of classification in the Forest Service is recommended for general adoption as both simple and logical.

Classification of the causes of forest fires.

- Forest Fires
  - Preventable: caused by man
    - Intentional
      - *Incendiary*
        - Maliciousness or wilful negligence
        - Contempt for the law
        - To cover crime.
        - To drive game.
    - Unintentional
      - Sparks or ashes from engines
        - *Railroads.*
          - Passenger, freight and work engines
          - Steam shovels and plows.
          - Logging engines.
        - *Sawmills.*
          - Permanent mills.
          - Temporary mills.
          - Portable mills.
          - Donkey engines.
      - Generally from uncontrolled fires
        - *Brush burning.*
          - Clearing lands or rights of way.
          - Slash, rubbish, or garbage burning
          - Stubble or meadow burning.
          - Light burning.
        - *Campers*
          - Construction campers.
          - Recreation parties and picknickers.
          - Miners and prospectors.
          - Hunters and fishermen.
          - Stockmen, including branding and protection fires.
          - Berry pickers and nut gatherers.
          - Cruisors, surveyors, and river drivers.
          - Smokers, children, tramps, etc.
        - *Miscellaneous.*
          - Fires from burning buildings, or, from prairie or other fires, if the origin of the original fire is not known If origin can be determined it is classified accordingly.
          - Sparks from chimneys and stacks other than those classified under "Railroads" and "Sawmills." Blasting, except as covered by the classification "Brush Burning."
          - From electric wires, unless accompanied by lightning.
          - Spontaneous combustion, either chemical or mechanical.
  - Generally unpreventable
    - *Unknown.*
      - Includes fires the cause of which is not determinable with reasonable certainty.
    - *Lightning*

The most accurate data on the causes of forest fires are from the records kept on the National Forests.

Average per cent. of causes to total number of fires on the U. S. National Forests from 1906 *to* 1911 *inclusive.*

Railroads	26.7
Lightning	17.5
Incendiary	4.5
Brush burning	4.8
Campers	16.9
Sawmills	1.1
Unknown	20.7
Miscellaneous	7.8

A number of conditions in the forest contribute either to the inception or to the spread of fires.

Contributory forest causes	natural - litter, etc. artificial - logging refuse, etc. insects.

The climate also must be considered with other variable factors a contributory cause of fires.

Contributory climatic causes	droughts. hot seasons. hot waves. warm winds.

2. — The forest fire season of 1911 marked the first year's operation of section 2 of the Weeks law. This section authorizes the U. S. Secretary of Agriculture to co-operate with States in protecting from fire the forested watersheds (catchment basins) of navigable streams.

The States which received Federal aid under Weeks law in 1911 were 11, and the total amounts expended by them and by the Government were as follows:

		$
States Expenditure		101 209 74
Federal „		38 793.55
Allotment to States		45 600.00
Unexpended	Balance of allotment	6 806.45
	„ „ $200 000 fund Jan. 1, 1912	161 206.45

There are reported many practical results of the work done under the Weeks law. Hundreds of fires left by campers, fishermen and hunters, or set by careless smokers and by locomotives, were discovered by patrolmen and promptly extinguished. Great progress was made on permanent improvements that will simplify future fire control and prevention. But in addition to these tangible results, which have been apparent from the start, the educational value of the work, although not measurable has been far-reaching. Except in a few States, 1911 was the first year when any systematic State patrol of the forest was conducted; it marked the general extension of the State organization co-operating with the Federal Government. The most effective work of the patrolmen was in warning persons met in the woods of the danger of setting fires, and informing them of the fire laws.

3, 4, and 5. — The U. S. Forest Service has made various publications on forest fires prevention and control. The following are the chief points as set down by the Chief Forester, H. S. Graves.

For the successful protection of a forest from fire there are necessary:

a) the elimination, so far as possible, of the causes of fires;
b) a proper organization of the forest, including the disposal of slash, the opening of roads, the construction of trails, etc.;
c) an adequate supervision;
d) facilities for fighting fires.

As to the principles of fighting forest fires, they are recognized essentially as those of fighting fires in cities. The following are of first importance:

a) quick arrival at the fire;
b) an adequate force;
c) proper equipment;
d) a thorough organization of the fighting crew;
e) skill in attacking and fighting fires.

LIVE STOCK AND BREEDING.

HYGIENE

144 - Warble Flies.

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II. *Distribution* and *Life History*. — The Ox Warbles or Bots (*Hypoderma bovis* Geer and *Hypoderma lineata* Villers) belong to the Diptera, family Oestridæ. Both are found in Europe. According to Railliet (Bibl. 1) (1) *H. bovis* is found also in Asia and Africa. Up to now only *H. lineata* has been met with in North America. According to a communication from the Government of the Commonwealth of Australia, that continent is free from warble flies. On imported cattle in some cases warbles were observed, but the animals were quarantined and the larvæ destroyed.

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(1) The numbers refer to the corresponding numbers of the Bibliography.

An official of the United States Bureau of Animal Industry observed that the female of *H. lineata* deposited its eggs, about 1 mm. in length, by means of a blunt ovipositor on the hair of the cattle, most frequently preferring the hair of the forelegs. As many as six eggs have been found on one hair. Every egg has an appendage, which adheres to the hair. The eggs contain fully developed young larvæ. Egg-laying takes place during the warmest part of the year.

Cooper Curtice (Bibl. 1) found in 1890 young larvæ of *H. lineata* in the throat of cattle, and it is probable that the eggs are licked off by the animals and thus find their way into the cavity of the mouth, where the larvæ hatch out. They migrate thence into the muscular tissue of the gullet and moult after some time. Later, in the winter months, warble larvæ are found in the adipose tissue of the spinal cavity and towards spring they appear under the skin. Here they moult twice, producing abcesses. They bore an aperture through the skin, which at first serves for the introduction of air; then, when they have completed the bot or maggot stage, as a passage by which they leave their host.

They then fall to the ground on which, or just under the surface, they turn to pupæ and emerge, after from three to six weeks, as perfect sexually mature flies.

In the Southern States of the United States the first warble flies appear in the spring (Bibl. 28); in Europe their appearance is limited to the summer months from June to August. The fully developed warble fly has only rudimentary mouth parts; it consequently takes no food and lives but a short time.

What has been said of *H. lineata* holds good for *H. bovis*, with the exception that until lately no investigator had been able to ascertain whether this oestrid also laid its eggs on the hair of cattle and which part of the animal it preferred. In the summer of 1912, Gläser (Bibl. 18), however, was enabled to observe an unfecundated female of *H. bovis* laying eggs. He set the fly on the back of a bull, and saw after some time that this fly drove its ovipositor into the coat of the animal. He then found, on a spot about half a square centimetre in extent, eight eggs, and on another, about one square centimetre, upon which the fly had also stopped, six eggs adhering to the hair on the back of the bull, and rather close to the skin. The eggs were visible only when the hair was rubbed the wrong way. According to this observation it is very probable that under natural conditions normally developed and fecundated females of *H. bovis* lay their eggs on the coats of cattle and, like *H. lineata*, attach them to the hairs. In support of this view is the fact that the eggs of both species are provided with an appendage which serves for fastening the eggs to the hair. Carpenter (Bibl. 5) supposes that *H. bovis* also lays its eggs by preference on the hair of the feet, because he observed that in Ireland warble flies swarmed especially round the feet of animals.

Opinions are still divided as to how the larvæ of *H. bovis* find their way into the body of the cattle. Hinrichsen had (according to Railliet) already in 1884 discovered larvæ of these flies in the throats of cattle. Peter (Bibl. 14) examined, during 1910 and 1911, in the Hamburg slaughter house, the gullets of 9326 head of cattle and found 2013 of them containing Hypoderma larvæ. In April the affected gullets were 9.29 per cent., in May 1.75 per cent., from December to February from 28.39 to 32.42 per cent. Other investigators have found larvæ in the midriff, in the spinal cavity and in the muscular tissue under the skin. Nevertheless Stub (Bibl. 2) sets up the theory that the larvæ found in the throat do not attain full development, but perish in the body of the animal. According to him the larvæ of *H. bovis* can only develop normally when they have bored a passage through the skin from the outside. He found, on examining the hides of slaughtered animals, minute passages which went right through the hide, each of them containing at its inner extremity a young warble larva in the first stage of development (after the first moult). Several of these passages from the outside reached only to about the middle of the hide. Gläser (Bibl. 18), on the other hand, asserts on the strength of his observations that passages are to be found which, starting from the inside, do not go right through the hide. He admits the existence of fine passages through the hide, but says that Stub carried out his observations in March, namely at a time when possibly all the larvæ have already bored through from the inside to the outside. Peter (Bibl. 13) is of opinion that the larvæ enter the animal by the gullet, bore through the hide from the inside as far as the roots of the hairs, and from this point to the outside the opening is completed indirectly by inflammatory processes. In support of this view Peter in his paper gives several figures showing cross sections and a longitudinal section of such passages.

Carpenter (Bibl. 5, 6, 7) has been conducting experiments for some years past in Ireland, with the object of ascertaining how *Hypoderma* larvæ enter the bodies of cattle. He kept during the years 1904 and 1905 four calves always covered with a cloth together with other calves on a pasture; in the summer of 1905 four other calves were provided with coverings for their limbs also, and further six calves completely covered were kept on the pasture. Of these only one lived to the next spring. The average number of warbles found on the calves protected by clothing differed very little from that found on the unprotected animals. Only the completely clothed surviving calf was found in spring to be quite free from the larvæ. (At the last counting of the larvæ in May it was not possible to ascertain with certainty which of the calves had been completely clothed during the preceding year).

In the summers of 1906, 1907, 1908 and 1909 Carpenter provided several calves with leather muzzles and kept them with other calves on a pasture. The muzzles were to prevent the calves from licking themselves and thus affording warble larvæ or their eggs the means of passing through the calves' mouths into their bodies. During the night and whilst feeding their necks were fastened in such a manner to a kind of wooden frame that the animals could not lick themselves, besides which, the fore-legs were clothed. Nevertheless, in the spring of 1907 five of these muzzled calves had 10 to 27 warble larvæ on them; only one was completely free. Two calves which had worn muzzles in 1907 bore no warbles in 1908. In the summer of 1908 other six calves were kept muzzled on the pasture. Instead of clothing their forelegs, a kind of apron formed by a sack was hung round the animals' necks to prevent them from licking their forelegs. The above-mentioned wooden frame was also used. In spite of these measures, in the following spring all the protected calves had an average of 4.66 warbles, against an average of 4.33 warbles on the nine unmuzzled control calves. In the summer of 1909 five muzzled calves were kept on the pasture. Over the leather muzzle a large wire one was placed so as to prevent the calves taking up larvæ through the openings in the leather muzzle. The other precautions were the same as had been previously taken. Together with these five calves fifteen control calves were sent into the same pasture. Each of these latter calves had in the spring of 1910 an average of 6.33 warbles. Three of the muzzled calves had only one warble each, one had three and one had four. Carpenter adds that by means of the double muzzle at least a partial protection against the larvæ was obtained. The results would probably have been better if the wire muzzles had been immediately used with the leather ones. But the former arrived only at the end of May, so that the calves were protected during the very warm last week in May only by the leather muzzles. — Carpenter is continuing his experiments.

III. *Kind and extent of injury caused by warble flies.* — There can be no doubt that warble flies injure cattle in various ways. In the first place their presence disturbs grazing cattle. In the Pedernales river valley in North America it has been observed that out of fear of warble flies the herds leave off grazing during the warm hours of the summer days and seek refuge in the river.

The injury that the animals suffer from the larvæ can consist in lower milk yield and in the depreciation of their flesh and hides. The loss in milk is valued by some as high as 20 per cent., but this estimation cannot be accurately checked.

The injury to the flesh consists in the inflammatory modifications it undergoes in consequence of the presence of the larvæ; the inflammation is revealed by the effusion of serum in the connective tissue and renders the meat unsightly; so called "licked beef."

The most mischief is that done to hides. Krause (Bibl. 17) has endeavoured to ascertain the extent of this damage in Germany. He sent a question sheet to all the largest tanneries requesting them to answer the questions referring to warbles in hides. About 50 works gave the desired information, with the aid of which, together with the statistics of the animals slaughtered in 1910, Krause calculated that in that year about 24 per cent. of all the hides in Germany were damaged by warbles: 31.03 per cent. in North Germany and 9.08 per cent. in South Germany. The total number of damaged skins amounted to 941 994. Assuming the depreciation in North Germany to be 3*s.* 9 $^3/_4$ *d.* and in South Germany 3*s.* 6 $^3/_4$ *d.* per hide, the total loss in Germany in 1910 was £178 142 8*s.*

The English Board of Agriculture (Bibl. 12) was informed by a tannery that out of 132 000 hides which had been worked, 40 000 were damaged by warbles. In another tannery only 1500 hides out of 20 000 were damaged. The depreciation amounted to from 2*s.* 6*d.* to 5*s.*

Gayets and Vaney (Bibl. 4) state that in Forez (Dep. de la Loire, France) on examining some herds, warbles were found on 4 per cent. of the cattle aged three years and upwards and on 52 per cent. of the one and two-year olds.

Rasquin (Bibl. 23) found that in several Belgian slaughterhouses 3.5 to 13 per cent. of the hides were damaged by warbles. He calculated the total number of damaged hides in Belgium to be 48 720 per year. The depreciation per skin is valued at 2*s.* 1 $^3/_4$ *d.*

According to De Vries (Bibl. 19) from 30 to 33 per cent. of the cattle of Holland are affected by warbles.

From the United States no recent figures are available. In the year 1889 an agricultural paper (Bibl. 1, 28) stated that from January to July about 50 per cent. of the cattle delivered at the Union Stock Yards in Chicago had warbles.

In Canada (Bibl. 29, 30) warble infection is especially considerable in the provinces of Manitoba, Saskatchewan and Alberta. It is customary to reduce the purchase price by two dollars for every head of cattle found suffering from warbles.

IV. *The destruction of warble flies* has not hitherto been rendered compulsory by legislation in any country except the German State of Oldenburg (Bibl. 17), in which a ministerial decree of March 11, 1910, orders that in the district of the Wesermarsch Herdbook Association the destruction of warbles is to be carried out. The Chamber of Agriculture of Oldenburg sent, in the years 1910 and 1911, a circular to the agricultural and milk control associations, enquiring as to the success which up to then had attended the destruction of the pest. In both years ten reports announce total or partial success; 6 reports do not communicate any success; 9 reports state that a conclusive opinion cannot be formed owing to the shortness of time during which the work had been going on. With few exceptions all the reports conclude in favour of continuing the experiment and demand that the compulsory destruction of warbles be extended to the whole Duchy of Oldenburg.

Denmark was the first country in which attempts were made to control warble flies by private initiative. The Skjaerum Dairying Co-operative Association began the campaign against warbles in 1902, and has carried it on since then (Bibl. 17). A specially trained staff examines the herds a fortnight before they are sent out to graze. The larvæ are removed by a steel instrument. Immediately before being sent to the pasture and several times in the course of the summer the animals are again examined and the larvæ removed.

The following table gives data on the cost of the work and on the results obtained.

Year	Stock	Head of Cattle	Number of Larvae	Cost per head of cattle d
1906	Old stock	3 756	4 016	0 458
	Cattle bought	286	4 980	
1907	Old stock	3 810	7 100	0.526
	Cattle bought	439	5 855	
1908	Old stock	4 076	1 123	0.392
	Cattle bought	186	2 448	
1909	Old stock	3 614	1 116	0.433
	Cattle bought	261	3 926	
1910	Old stock	3 348	369	0.352
	Cattle bought	209	3 506	

In Ireland, Carpenter (Bibl. 5, 6, 7) began in 1907 the destruction of warbles at the Agricultural Experiment Station of Ballyhaise. The average number of warbles per head of cattle in the herd sank from 10.77 in 1907 to 4.44 in 1908. In 1908 there were still 132 head of cattle which had been on the farm since the preceding summer. In 1909 the average number of warbles per head was 7.7 and in 1910, 7.52. It is worthy of note that all the animals that grazed always in the centre of the farm bore on average a much smaller number of warbles than those which were constantly kept on the outer fields.

The same observation was made, according to Boas (Bibl. 27) on the Danish estate Gaardbogaard in which warble destruction was practised.

In Germany a "Committee for the extermination of the warble pest" was formed in 1910. This Committee publishes a periodical and supports the scientific investigation on the life history of the warble fly. At the exhibitions of the German Agricultural Association (Deutsche Landwirtschafts-Gesellschaft) in Hamburg in 1910 and at Cassel in 1911 there were special exhibits showing leather with warble holes, skins with fresh abscesses and warble larvæ in their various stages of development.

In the Municipal Bureau of Public Health in Berlin a volunteer assistant for the investigation of the life history of warble flies has been appointed. For the defrayal of the expense, the Imperial Ministry of the Interior has contributed up to now about £ 200, several representative of the leather industry about £ 250 and other groups of people interested in the question about £ 150.

In France the French association for the destruction of warble flies was founded in November 1910, provisionally for 10 years. The members pay subscriptions of from 16 *s.* to £ 20. The association publishes a periodical containing papers on warble flies. In No. 2 of the above periodical there is an article intended as a guide for elementary school teachers in their lessons on warble flies.

The association has provided the veterinary school at Alfort and the school of tannery in Lyons with a steer affected with warbles to be used for investigations. It has further induced the horse gelders (Hongreurs) of the Department of Allier to undertake the campaign against warbles at the rate of 1*s.* 8*d.* per 100 larvæ. It appears also that school children receive a reward, somewhat higher than the above, for the larvæ they deliver. The association has also addressed a circular to the directors of agricultural schools, to the teachers of agriculture and to the departmental veterinary surgeons begging them to give assistance to the work of destroying warble flies. At the request of the Association the Minister of Agriculture has appointed an official for the investigation of the life history of the warble fly and has granted the Association a contribution of about £ 40.

In Sweden in the elementary schools instruction is frequently given on the warble fly and its destruction. It is believed that in consequence of this teaching the pest has somewhat abated.

The Ministries of Great Britain, Belgium, Switzerland, Austria, the United States and Canada have hitherto limited their action to instructing farmers by means of publications on warble flies.

From Russia, Norway, Holland, Italy and Hungary there are only private publications on the subject. In Hungary, however, the Council of Hygiene of Live Stock dealt with the pest in 1911.

The introduction of warble flies in Australia should be prevented by the Commonwealth Quarantine Act. The State entomologist for Queensland has proposed to the Australian Government to render this Act more stringent in respect of cattle affected by warbles. The Government will take an amendment of the quarahtine measures into consideration.

145 - **Anaplasmosis in Cattle** (1).

La tristeza en los bovines. Una nueva forma del mal. — *Revista de la Asociación Rural del Uruguay*, Year XLI, No. 9, pp. 684-686. Montevideo, 1912.

An extract from the account furnished by Dr. Lignières, Director of the Bacteriological Institute, and Chief of the Cattle Breeding Division of the Ministry of Agriculture of the Republic of Argentina.

Dr. Lignières showed some time ago, that inoculation with *Piroplasma bigeminum* did not confer immunity from *P. argentinum*, and that in spite of successive transmissions during a period of some months, the two parasites retained their own special characteristics. Similar statements are made in South Africa and elsewhere: thus the individuality of these two causes of pyroplasmosis has been established.

From the end of 1911 until April 1912, Dr. Lignières had occasion to study several abnormal outbreaks of gall-sickness ("tristeza") both in inoculated cattle and in creol cattle, which are naturally immune. On reproducing the disease in the laboratory by means of the blood of infected animals, he obtained a new form of "tristeza," caused by a hæmatozoon different from those hitherto found in Argentina.

Under natural conditions, the new disease usually does not occur alone, but is generally accompanied by *P. bigeminum*, and sometimes by *P. argentinum*. It appears as a chronic affection, with high. sometimes intermittent, fever, severe anæmia, great debility and diminution or entire loss of appetite.

The examination of the blood of infected animals at the time when the disease was at its height, revealed a relatively large number of parasites in globules stained by the Laveron or Giemsa methods. These parasites were completely spherical, deeply and uniformly stained; they generally occurred only in one or two globules and were situated near the periphery of the latter. The parasite is certainly an *Anaplasma*, and the studies being prosecuted by the writer will show whether or not it is identical with *A. marginale* Theiler.

Dr. Guth has observed coccus forms in Uruguay, which are probably to be referred to anaplasmosis; the latter disease was carefully studied at Sao Paulo by Dr. A. Carimi, Director of the Pasteur Institute at that place. In North America the existence of anaplasmosis has so far not been definitely proved, though it probably occurs there, since Messrs. Smith and Kilbern desciibe in their first publications dealing with Texas fever, coccus forms, which are situated at the periphery of the globules.

Dr. Lignières was able to produce anaplasmosis by means of the blood or organs of diseased animals, and by the agency of *Margaropus microplus* (the tick which spreads *Piroplasma bigeminum* and *P. argentinum*) obtained from infected cattle. Anaplasmosis is a far more serious disease than piroplasmosis; most of the infected cattle die, sometimes after resisting the malady for some weeks or months.

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(1) See No. 810, *B.* May 1912 and Nos. 42 and 43, *B.* Jan. 1913. (*Ed.*).

Inoculation against *Piroplasma bigeminum* and *P. argentinum* is of little effect against *Anaplasma.*

Dr. Lignières insists on the necessity of adopting special sanitary measures to prevent the spread of anaplasmosis, which seems only to exist in Argentina in limited areas in the north of the country.

146 - A Study of the Normal Blood of Carabao.

ANATOMY AND PHYSIOLOGY

BOYNTON, WILLIAM HUTCHINS: in *Philippine Islands Department of Public Instruction, Bureau of Agriculture, Bulletin* No 21. Manila, 1912.

The writer used for his researches 25 buffaloes from 2½ to 6 years old. Some of them were draught animals that had been immunized against rinderpest. The greater portion of the other animals had not been immunized.

The body temperature of the animals experimented upon was taken daily for several weeks before the examination of the blood began. The blood to be examined was always taken from a vein of the ear, after the ear had been well cleansed and dried with alcohol.

A short description is given of the methods followed in the investigations, as well as several tables of the results, which may be summarized as follows:

1) In the circulating blood of apparently normal buffaloes upwards of two years of age, an average of 6 057 520 red blood corpuscles were found per cubic millimetre of blood.

2) The average content of haemoglobin was 92.6 per cent

3) In every cubic millimetre of blood there were on average 10 389 leucocytes.

4) The average specific gravity was 1.0532.

5) The ratio of the blood corpuscles to the plasma was 29.1 to 70.9.

6) The time necessary for the complete coagulation of the blood was 3 minutes 16 seconds.

7) The following five kinds of leucocytes were found:

a) Lymphocytes; average diameter 7.3 μ; average number per cubic millimetre: 5049, or 48.5 per cent. of all the leuocytes.

b) Large single nucleus leucocytes; average diameter 10.8 μ; average number per cubic millimetre: 484, or 4.6 per cent. of all the leucocytes.

c) Polynuclear leucocytes; average diameter 9.4 μ; average number per cubic milimetre: 3598, or 34.5 per cent of all the leucocytes.

d) Eosinophil leucocytes; average diameter 10,9 μ; average number per cubic millimetre: 1142, or 11.5 per cent. of all the leucocytes.

e) Mastzellen; average diamter 7.8 μ; average number per cubic millimetre: 115, or 1.2 per cent. of all leucocytes.

FEEDS AND FEEDING

147 - Use of "Vindobona Pulp" on a Large Scale for the Ensilage of Sugar Beet Pulps, in Hungary.

KOPPELY, GEZA.: A "Vindobona pulpe" nagybani alkalmazása repaszelet bevermelésénél. — *Mezögazdák*, Year XIX, No. 21, p. 177. Budapest, November 1912.

Three years ago the writer introduced Bouillant's "Lacto Pulp" into the farms belonging to the Hatvan sugar factory and employed it with success for the better preservation of the ensilaged beet pulps. M. Heggi, Chief of the Station of Plant Physiology and Pathology at Magyaróvár, was then occupied with the question, and described the good results of his experiments of pure cultures in milk serum for the preservation of ensilaged pulps. This encouraged the Halvan sugar factory to use on a greater scale the "Lacto pulp" imported from France.

The favourable results of the first year's experiments induced the writer to inform the agricultural public of the use of the pure cultures in milk serum and to call the attention of the sugar factories to them. He has since adopted the "Vindobona pulp" prepared at the Moser laboratory in Vienna, which is also a pure culture in serum, legally guaranteed (1), and he reports briefly upon the results he obtained in 1911 with the ensilage of 1300 railway car loads of fresh pulp, on which "Vindobona pulp" was sprayed whilst being put into the silo. This treatment diminished by about one quarter the loss of weight due to excess of fermentation which in previous years had attained to 34 per cent. It also improved the quality of the pulp, which was more relished by the live stock than the untreated pulp.

In order to compare the loss in weight between the treated and the untreated ensilaged pulp the writer, assisted by M. Arthur Zaitschek, chief chemist of the Royal Station of Biology and Stock-feeding, conducted the following experiment:

On November 24, 1911, two silos were filled: one containing 1634 cwt. of well pressed pulp treated with "Vindobona pulp", the other 1649 cwt. of pulp equally well pressed but not treated. On July 20, 1912, the first silo yielded 1247 cwt. and the second 1107 cwt. of pulp. Consequently the loss of pulp in the first was 388 cwt., or 23.8 per cent., and in the second 542 cwt., or 32.9 per cent. The loss of weight in this experiment was thus the same as that previously observed by the writer, who warmly recommends all farmers to use the "Vindobona pulp" treatment.

BREEDING

148 - Some Data on the Inheritance of Horns in Sheep.

ARKELL, T. R.: *New Hampshire Agricultural Experiment Station, Department of Animal Husbandry, Bulletin* 160. Durham, N. H., May 1912.

According to Darwin, when a cross is made between horned and hornless sheep, the male offspring under certain conditions develop horns but the females are hornless.

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(1) For details of the "Vindobona pulp" treatment see M. Busits-Joszsef's article in *Köztelek*, Year 22, No. 95, pp. 3252-3253.

Wood found that the F1 generation arising from the mating of horned and hornless sheep, by breeding *inter se* produced about 75 per cent. horned and 25 per cent. hornless males, while among the female offspring of the F1 generation 75 per cent. were hornless and 25 per cent. were horned.

The writer states that Darwin's and Wood's data do not correspond exactly to reality, for sheep according to the condition of the horns they bear may be divided into three categories:

1) Breeds with both males and females heavily horned (as the Dorset Horn and Lonk).

2) Breeds with the males only horned (Merino class; frequently hornless males are found, and at times females with some signs of horn growth.).

3) Breeds with both sexes hornless (Downs and many coarse-wooled sheep, the most prominent of which are Lincoln, Cotswold and Leicester).

The writer has discovered by actual measurements that little appreciable variation exists in the size of the horns of Dorsets under similar conditions of feed and care. This, however, does not hold true for Merino sheep. They are most variable even within the same breed or strain. Some males carry heavy, others short light horns, and in many breeds they are hornless. All authorities on sheep concur that Merino ewes are hornless, yet many practical Merino sheep raisers have admitted to the writer that a mere scab, or very short loose scur, may appear every now and again from the horn pits of some Merino ewes. The writer himself found at times a short hard knob protruding from the horn pits of Merino ewes. In 53 out of 128 American Merino ewes he found these knobs or excrescences, and 5 of these had besides scabs or short scurs.

Castration seems to have a decided influence on the development of horns. This question, however, needs further investigation.

The writer has (in *Science*, N. S., Vol. XXV, No. 897) together with Davenport, and combining the results of other investigators with those of their own breeding tests, formulated the hypothesis that horns in sheep represented a typical sex-limited character. According to this hypothesis there is an inhibitor in the sex chromosome which weakens or neutralizes the horn determiner; the hypothesis assumes further that the male sex in sheep is heterozygous (simplex), it possesses only one sex chromosome, while the female sex has two, and is homozygous (duplex). The inhibitor for horn formation will at times be double in female sheep and single in the male. Further the determiners for horn formation are not equally strong in all breeds of sheep. The writer distinguishes in this respect a vigorous determiner H (Dorset Horn type) and a weaker determiner H_1 (Rambouillet type). The absence of the horn determiner is represented by h. In the zygote the single inhibitor is incapable of preventing the development of horn when this zygote has two determiners (HH or H_1H_1) or one (Hh or H_1h). In the latter case, however, the formation of horn is much reduced. Males with one horn determiner are lightly horned, those with two heavily horned. Only the double inhibitor occurring in the female zygote is capable of suppressing completely the development of horn when there is only one determiner (Hh or H1h); it cannot suppress it when it contains two determiners (HH). If there are two weak determiners (H1H1) the above mentioned excrescences or knobs, scabs or scurs in the horn pits arise. When the determiners (H or H1) for the formation of horn are lacking, no horns appear.

For his breeding experiments the writer used Dorset Horns, Merinos and South Downs, altogether 113 individuals. As common standard for the study of horns the ratio of circumference to length was taken. The length of the horn was measured from the poll to the tip of the horn, once on the inside and once on the outside. An average between the two gives the length of the horn. The circumference is taken as close to the poll as possible.

The tables appended contain all the combinations of determiners theoretically possible with the matings made. Further tables give information on the crosses obtained and on the resulting F1 and F2 generations.

The results of the crosses can be well explained by the theory of the writer. He however does not consider the problem of the inheritance of horns in sheep as one finally solved; he hopes soon to be able to contribute further material towards its solution.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

149 - Stock Census in Hungary for the Periods 1895-1911 and 1911-12.

KOMAROMI, SANDOR. Haszonállatainк. — *Politikai Hetiszemle*, Year XIX, No. 52, pp. 7-9. Budapest, December 29, 1912.

The Royal Hungarian Minister of Agriculture has just published a report of the stock census taken in the spring of 1912. The only satisfactory fact to be noted is an increase in the total number of pigs. The other animals continue decreasing, as is shown by the following table.

	Total in 1895	Per 1000 inhabitants	Total in 1911	Per 1000 inhabitants	Total in 1912	Per 1000 inhabitants
Cattle	5 829 585	365.2	6 185 264	338.6	6 036 945	325.3
Horses	1 997 098	125.1	2 001 431	109.6	1 960 000	105.6
Mules and donkeys .	22 281	1.4	18 769	1.0	16 954	0.9
Goats	286 392	17.9	331 383	18.1	313 839	16.9
Pigs	6 447 370	403.9	6 416 424	351.3	7 409 801	399.1
Sheep	7 526 784	471.5	2 697 719	421.5	7 168 054	386.2

The increases (+) and decreases (—) are as follows :

	1895-1911		1911-1912	
	On the total number	Per 1 000 inhabitants	On the total number	Per 1 000 inhabitants
Cattle	+ 354 679	— 25.6	— 147 319	— 13.3
Horses	+ 4 333	— 15 6	— 41 431	— 4.0
Mules and donkeys	— 3 512	— 0 4	— 1 815	— 0.1
Goats	+ 44 991	+ 0 2	— 17 534	— 1.2
Pigs	— 30 946	— 52.5	+ 993 377	+ 47.9
Sheep	+ 170 935	— 50 0	— 529 665	— 35.3

From 1895 to 1911, the total number increased, except in the case of pigs, mules and donkeys. From 1911 to 1912, the pigs alone increased.

Independently of the more or less correct statistical data it may be stated that, up to the present, the industry of cattle breeding as a whole has not shown signs of a capacity for improvement. A fresh proof of this is afforded by the stock census of 1912. The Ministry of Agriculture has made every possible effort to change the situation, but so far, pig-breeding alone has shown favourable results, while an improvement in cattle breeding will only follow the accomplishment of the measures taken for extending and improving the pastures, distributing breeding animals at reduced prices and avoiding the loss occasioned by foot-and-mouth disease and other contagious diseases.

The total number of cattle in Hungary is not sufficient to meet the large demand for milk, meat and exportation. Not only is the number of cows in this country less than that in France (52 per cent. of the whole number of cattle), in Germany (53 per cent.), in Italy (55 per cent.), in Denmark (57 per cent.), in Sweden (58 per cent.) and in Argentina (51.5 per cent.), but it does not even remain stationary, having decreased from 44.4 per cent. in 1911 to 44.2 per cent. in 1912. On the other hand only 1 183 921 cattle were slaughtered in 1911, a reduction of 288 683 head, or about 20 per cent., on 1910. Finally, in 1911, 254 956 cattle were exported, or 167 351 (39 per cent.) less than in 1910. The total number of cattle for the butcher and for the export trade should have increased in 1911 by 458 034, or 7.4 per cent., which ought to have been shown by the stock census of 1912, while, on the contrary, the total in 1912 was lower than that of 1911.

In short, the live stock reared in no way satisfy the requirements of the country.

150 – Live Stock Breeding in the Province of Entre Rios, Argentina.

1. La ganaderia en Entre Rios. — *Gaceta Rural, Mercantil e Industrial*, Year VI, No. 63, pp 223-227 Buenos Ayres, October 1912.

2 The Province of Entre Rios in 1911 — *The Review of the River Plate*, Vol. XXXVIII, No. 1092, p 1138 Buenos Ayres, November 1, 1912

The Province of Entre Rios, with its slightly undulating surface traversed by the numerous, and to a great extent navigable, tributaries of the Paranà and Uruguay Rivers, is eminently adapted to live stock raising, owing to its topographic and climatic conditions, to the extent of its pastures and the good quality of its spontaneous grasses. Agriculture also, favoured as it is by the natural fertility of the soil, is in constant progress. In 1911, 1 985 732 acres were cultivated; of these:

722 529	acres were under	wheat
880 747	„ „ „	flax (for the seed)
103 605	„ „ „	maize
210 772	„ „ „	oats
40 456	„ „ „	lucerne

Nevertheless the principal wealth of Entre Rios consists of live stock, to the rearing of which 14 374 106 acres (out of the total surface of 18 711 238 acres) were devoted in 1911. The numbers of animals in that year were the following:

2 226 352	cattle
534 114	horses
17 845	asses and mules
6 720 487	sheep
23 238	goats
36 961	pigs

The above figures, if compared with the returns of the "Censimento Agro-Pecuario" of 1908, show a falling off, due to the consecutive droughts of 909 and 1910.

Among the various breeds of cattle, Shorthorns are preferred, on account of their precocity and of the excellent results attendant upon their use in the improvement of the native ("criollo") cattle; nevertheless in some parts of the centre and north they are losing ground and are being replaced by Polled Angus and Herefords, which are hardier (especially as regards resistance to anthrax and "tristeza" or redwater) and stand the summer heat better, besides being less exacting in their requirements.

Among the sheep, the Romney Marsh breed holds the first place. After many tests extending over several years it has given origin to a variety which is an excellent producer of meat and wool, and valuable in the improvement of other breeds, enabling it to compete with the famous and widely spread Lincoln breed. In the northern districts the black-faced Shropshire Downs are much esteemed.

Among horses, Hackneys, Anglo-Normans and English race-horses are bred, and in the Montiel district the ancient " criollo " horse, of which thorough-breds exist, is bred.

Among pigs, Yorkshires and Berkshires predominate.

The principal products of the above animals (excluding horses) are meat, or meat and wool. The dairying industry is of quite recent growth and is still unimportant. The exports consist either of living animals (to Brazil and Uruguay) or of salt meat. There are in the province six "saladeros," which in 1911 dealt with 353 075 head of cattle, 586 young horses and 9 449 sheep.

The crossing of the native breeds has only recently been commenced; it has, however, already given excellent results. It is chiefly practised in the departments of Gualeguaychu, Gualeguay and Victoria, and in a great part of those of Concordia and Uruguay, as this region is immune from ticks, which allows of Durhams being introduced.

The agricultural associations and the prize competitions that they have held, have contributed a good deal to the improvement in live stock breeding and rearing.

151 - The Encouragement of Horse-Breeding in Brazil.

Criaçao do cavallo nacional. — *A Evoluçao agricola*, Year IV, No. XL, pp. 18-19. Sao Paulo, October 1912.

The National Congress of Brazil, after having determined the conditions which entitle horse-breeding societies to receive Government subsidies, have decided to appoint an official Stud Book Commission presided over by the Minister of Agriculture and entrusted with : instituting and keeping an official studbook for thorough-breds ; issuing certificates ; examining the certificates and documents of animals which are to be entered ; keeping registers of the latter; establishing the identity of such animals, and deciding *ex officio* all questions respecting them.

All imported thorough-breds are to be entered in the Studbook. It is obligatory that all thorough-breds born in Brazil should also be entered, if they are to enjoy the privileges granted by this law. Racing Societies are obliged, under penalty of forfeiting the subsidies of the Federal Government, to organize, at all their race-meetings, competitions for home-bred animals of 2, 3, 4 or more, years of age, from April to June, and for animals of 3, 4 or more years of age, from July to the end of the racing season. Further, they must offer for the above-mentioned horses, in the federal capital, three annual prizes (" grands prix ") of not less than 5000 milreis (about £312) in value. The breeders of the winners will receive 5 % of the sum of the first prize. Only horses entered in the studbook will be allowed to compete ; the programme will be examined by the Studbook Commission. The racing societies which conform to the provisions of this law will receive from the Federal Government a subsidy of 15000 milreis (about £940), and are exempt from the payment of any federal taxes.

HORSES, ASSES AND MULES

152 - The Breeding of Mules for the Market in Missouri.

CHANEY, WALTER S. — Market Mules in the Making. - *The Breeder's Gazette*, Vol. LXII, No. 25 (1621), pp. 1362 and 1366a. Chicago, December 18, 1912.

The mules foaled in the spring in the mule-breeding districts of Missouri run with their mothers on bluegrass (1) pasture till weaning time in autumn; and during this time they get nothing besides mare's milk and grass. They are generally sold in autumn to traders, at prices ranging from $ 50 to $ 125 (£ 10 5 s to £ 25 15*s*); the trader divides them into lots, selling the best forthwith, while the others are put onto bluegrass again, often getting the run of corn (maize) stalk land also.

Only the better quality ones get some corn, oats and hay besides the bluegrass and corn leaves. They are generally left out all winter. They put on thick, shaggy coats in autumn. They are kept on bluegrass through the next summer, and wintered on this and corn stalk land.

As two-year-olds the mules are bought mostly by small farmers, who break them and work them for the season; of the price of a pair ($ 400 to $ 500, i. e. £ 80 to £ 100), the trader gets only a small part, the rest being secured by a promissory note for twelve months at 8 per cent. interest, with a mortgage on the animals; this note he may sell to a bank if he requires the money.

As three-year-olds, the mules are bought by dealers, who fatten them up before selling them in lots of twenty or more at Kansas City or St. Louis. There they are divided into several classes: sugar mules, cotton mules, miners, railroad mules, logging and turpentine mules, and others.

The sugar mules must show great quality, being thoroughly well bred; they are 3 to 6 years old, and 16 hands or more in height, weighing 1175 to 1350 lbs.; they must have fine heads, sleak coats, clean limbs, and be without blemish; mares are much preferred.

Cotton mules are practically like sugar mules only smaller, 14.2 to 15.2 hands high.

Miners must be short legged and as heavy as possible; they may run from four up to ten years old; slight blemishes do not matter, as they are for slow hard work.

The log or turpentine mule is used in the forests of the south-eastern States; size is the great requisite; in age they run from six to ten years.

Railroad mules are big and strong, with plenty of room behind the shoulders; horse and mare mules are of equal value for this purpose and a few slight blemishes do not hurt their value.

CATTLE

153 - The Supply of Agricultural Cattle in India.

LOW, C. E. in *The Agricultural Journal of India*, Vol. VII, Part IV, pp. 331-342. Pusa, October 1912.

Attention has frequently been called to the diminution in the number of cattle which is said to be taking place in India.

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(1) *Poa pratensis:* known in England as smooth-stalked meadow-grass. (*Ed.*).

The writer does not consider that there are any grounds for this statement, and gives in support of his opinion, statistical information regarding the cattle of British India (not including Bengal). Although it is difficult to ensure accuracy in the enumeration of cattle in India, yet for some years past an ever increasing degree of accuracy has been secured, and according to the writer, the probable error in most parts of India does not now much exceed 5 per cent. The following table shows the total number of cattle in each of a series of selected years, also the cropped area and population throughout British India. To make this statement clearer, the figure of the initial year has, in each case, also been expressed as 100 and that of each succeeding year has been reduced to the proportionate figure.

Progressive increase in cattle, cropped area and population in British India, excluding Bengal.

(All figures save percentages are in thousands).

Year	1885/86	1890/91	1895/96	1900/01	1905/06	1909/10
Nett cropped area	128 283	138 265	135 487	146 708	155 452	170 862
Percentage	100	107 8	105 6	114	121	133
Total number of cattle	53 921	73 375	78 581	84 434	91 130	94 903
Percentage	100	136	145 7	156.5	169	176
Total population of nearest census year	152 141	171 926	171 926	180 890	180 890	191 599
Percentage	100	113	113	118.9	118.9	125.9

It is clear that there has been an increase in the number of cattle, this increase being more rapid than that of the cropped area. The proof of this increase is not only derived from statistics, for there is necessarily a limit to the number of acres which a pair of oxen can cultivate, and as the cropped area has been steadily rising, it follows that the number of cattle has increased.

There is also an increase in the price of cattle, owing to more grassland having been brought under cultivation and no longer serving as grazing grounds. The price of draught oxen rises with the increased demand. Cattle and fodder being alike dearer, cause a rise in the price of milk.

The breeding of cattle is carried on, partly by cultivators in their villages, partly by professional graziers in forest or other large grazing areas. In the first case, the breeding animals are ill-tended and ill-fed, and the tendency is to breed an inferior animal, whose only recommendation is that it can live on a minimum of food.

More attention has, however, been paid to cattle of late in the irrigated areas ; and stall-feeding is here on the increase. The Government has wisely divided its forest areas available for grazing into grazing units and has fixed the number of animals that can be allowed to feed there.

An increase in the number of cattle can only be expected when stall-feeding is more extensively practised under circumstances which will secure in all years an adequate supply of the necessary food. Lucerne and Egyptian clover (*Trifolium alexandrinum*), under favourable circumstances, will give a heavier yield of fodder than any other crop. Several varieties of millet give heavy yields of fodder under irrigation.

Irrigated pastures, which are already beginning to find favour, are another alternative. Oil cake, which is now usually sent to England, would be a valuable adjunct to bulky fodder.

Were it practicable to bring the whole cultivated area of India under irrigation, the question of cattle-feeding would soon be solved, but as this is out of the question, it is necessary to consider the best methods of dealing with areas where irrigation is not practicable. In such districts, millets and pulse are the main stand-by. In years of ordinary rainfall, the supply of the former is usually in excess of the demand and the surplus is habitually sold, or wasted. An efficient method of storage is required, so that the surplus stock of one year could be kept till the next and thus a continual supply of fodder would be ensured. Experiments at Berar have shown that *juari* stalks can be stored successfully for more than a year, with little or no loss.

The grass in the Government Forests could be more economically used by feeding, than by grazing, and the policy of the Central Provinces Forest Department is now " Cheap grass and dear grazing." This department is throwing open forest areas, where no effective demand for grass exists, to capitalists who are prepared to maintain a proper number of cattle of good type.

The Civil Veterinary Department has done much of late years to control the inroads of infectious disease. In the year 1910-11, 309 253 cattle were inoculated and 756 895 head were treated otherwise than by inoculation.

154 - Afrikander Cattle.

HOLM, ALEX in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 5, pp. 687-692. Pretoria, November 1912.

The name " Afrikander " is unfortunately applied to all common or mongrel bred stock in South Africa, but there is a pure breed named " Afrikander," of ancient lineage, possessing much prepotency and quite fixed in type. The idea that this breed owes its origin to, or has been influenced in its creation by, Devon cattle imported to South Africa has been found to be incorrect, for it is proved that pure Afrikander cattle existed in the latter country at the beginning of the 19th century, before the first Devons were imported. However, it is not unlikely that there is an indirect relationship. During the sixteenth century, Portugal had considerable trade with the Cape Peninsula; later, during the régime of the East India Company in the latter part of the seventeenth century, there was a good deal of traffic between the Cape and the Indian Archipelago, and probably cattle were brought from Portugal and Java to the Cape. About the same time as Portuguese cattle were shipped to the Cape, it is also probable that they were landed on the southern shores of England and therefore that they had some influence upon the cattle bred in the counties of Devon and Somerset, from which the Devons of to-day subsequently sprang.

Although the Dutch colonists imported their black and white cattle to South Africa, the writer does not think that the latter played an important part in the creation of the Afrikander.

The Afrikander was first and foremost a "trek ox", and before the days of railways, these animals were used in transport waggons; this had a great influence on the breed, as active, strong oxen, uniform in type, colour and outline, were selected for these purposes.

The present Afrikander cattle are red, with long head, wide-spreading horns, very muscular neck, powerfully developed shoulders, slightly depresssed back, muscular hindquarters, and powerful legs, with medium-sized hoofs and even, round, deep toes. It is a hardy breed, suited to the South African climate and excellent for draught purposes. They are slow in coming to maturity; the oxen are full-grown at from six to seven years of age and weigh 600 to 750 lbs. dressed carcass. The milk yield of the cows is low, though individual animals are fair milkers.

In the summer of 1912, an Afrikander Cattle Breeders' Society was formed for fostering the breed and having it registered in the South African Herdbook. The writer gives the standard of excellence and the scale of points then adopted. Some good illustrations elucidate the text.

155 - Maize Distillery Residues as a Feed for Milch Cows: Influence on the Composition of the Milk.

WEISER, ISTVAN. Friss és száritott moslék befolyása a tej és tejsserum összetételére. — *Köztelek*, Year 22, No. 83, pp. 2862-2863. Budapest, October 26, 1912.

Experiments carried out at the Royal Station for Animal Biology and Feeding at Budapest on the influence of watery feeds on milk yield and the composition of the milk have shown that the amount of water taken by the cows has no influence on the composition of the milk. Of the five watery feeds tried, not one reduced the solid constituents of the milk below the legal minimum.

In the 1912 experiments, in the comparison of the feeding value of wet and dried distillery residues, the writer made a trial as to whether wet residues, given to the cows in larger quantity than the dried, had any effect in diluting the milk.

In an 80 days' experiment, two six-year-old cows from the Innthal, not in calf, were used; during the whole period the milk-yield remained the same. The experiment was divided into three periods: 1) dry feed; 2) wet feed, and 3) dry feed again. Each period was long enough to avoid any after-effects of the previous one. Prior to the commencement of the experiment the cows had been on dry feed.

The first period lasted 12 days; each cow had 20 lbs. of hay, 1 to 2 ¼ lbs. of barley, 1 lb. of pumpkin-seed cake and 4 ½ lbs. of dried maize distillery residue.

In the second period, of 49 days, while the rest of the ration remained the same, the dry residue was changed to wet residue, the amount being varied to study the effect on the composition of the milk; the amount was: first day, 55 lbs. per cow; next 13 days, 72 ½ lbs.; next 19 days, 60 ½ lbs.; next 15 days, 121 lbs.; last day, 60 ½ lbs.

In the third period, bran was given instead of the wet residue.

During the experiment the following were determined: 1) water consumed; 2) yield of milk; 3) specific gravity and fat content; 4) specific gravity and refractive index of the milk serum, this giving indications as to dilution. The water consumed during the experiment was:

	Cow I. lbs.	Cow II. lbs.
Period I: dry feed	60.2	58.4
Period II: wet feed (average) . . .	85.0	81.7
Period III: dry feed	53.8	49.4

Although the cows drank very little water during the wet feed period (no. I taking 5.7 lbs. and no II 2.6 lbs. per day on an average), the total consumption of water in this period exceeded the average of the other two periods by about 50 %.

The following are the figures for the composition of the milk during the experiment:

Period I: dry feed.

	Cow I.				Cow II.			
	Milk		*Milk serum*		*Milk*		*Milk serum*	
	S. G.	% fat	refractive index	S. G.	S. G.	% fat	refractive index	S. G.
Max.	1.0332	4.47	40.9	1.0279	1.0334	4.40	41.4	1.0284
Min.	1.0320	3.90	39.8	1.0267	1.0317	2.80	40.0	1.0269
Av. . . .	1.0323	4.16	40.4	1.0267	1.0327	3.81	40.5	1.0275
Period II: wet feed.								
Max.	1.0337	4.90	41.0	1.0277	1.0341	5.12	41.0	1.0280
Min.	1.0316	3.00	39.6	1.0258	1.0318	3.20	39.5	1.0267
Av.	1.0325	4.19	40.4	1.0268	1.0331	3.69	40.2	1.0272
Period III: dry feed.								
Max.	1.0346	4.57	40.6	1.0273	1.0350	4.60	41.9	1.0280
Min.	1.0327	3.95	39.7	1.0267	1.0316	3.35	39.8	1.0264
Av.	1.0336	4.24	40.1	1.0268	1.0335	3.99	40.2	1.0270

It is thus seen that the specific gravity of the milk of both cows rose very slightly throughout the experiments; the average fat content of cow II fell slightly during the wet feed period, but not enough to have any practical significance; the refractive index and specific gravity of the serum showed hardly any change.

These results show that the wet feed caused no diluting of either the milk or the milk serum. Even when the cows were getting abnormal amounts this still held good: during the 14 days of heaviest feeding cow I took 123 lbs. and cow II 130 lbs. of the wet residue per 1000 lbs. live-weight; the following figures show the composition of their milk in this period:

	Cow. I.	Cow. II.
Specific gravity of milk	1.0325	1.0334
Fat content of milk	4.22	3.49
Refractive index of serum.	40.4	40.1
Specific gravity of serum	1.0269	1.0271

The writer concludes that feeding large quantities of wet distillery residue does not affect the composition of the milk enough to have any importance in practice.

156 – Cacao Husk as a Feed for Milch Cows.

LUCAS, J. E. Les Coques de Cacao dans l'Alimentation des Vaches laitières. — *Annales de la Science Agronomique*, Year 29, No. 5, pp. 321-347. Paris, November 1912.

The writer gives an account of some feeding experiments which he made with cacao husk for the purpose of ascertaining its effect upon the milk yield of cows. There were four experiments in all; in the first were two lots, in the second three lots and in the third two lots: each lot consisted of four cows. In the fourth experiment two lots, each of three cows, were used. All the lots were as similar as possible.

Each experiment consisted of a preliminary, a principal and a concluding period. Experiments I and II each lasted a month; the two other experiments occupied a somewhat shorter time.

In every case a control lot was fed on rations of bulky food, maize-gluten and bran, while in experiments I and II the bran which the other lots received was gradually replaced by cacao husk; the latter was entirely substituted for the bran in the principal period: 4 $^2/_5$ lbs. of cacao husk per cow per day in the place of 3⅓ lbs. of bran; for a short time 6 $^3/_5$ lbs. of cacao husk was fed. In experiment III only part of the bran in the rations was replaced by cacao husk, and at the conclusion of experiment IV an addition of 750 gr. (1 $^3/_5$ lb.) of cacao husk was made to the full rations containing the usual amount of bran.

During the time of the experiments, every milking was weighed and the fat content of the milk determined by Gerber's test.

The summary of the results of the experiments is as follows:

1. The cacao husk used noticeably diminished the milk yield, the decrease being as much as 20 per cent.

2. At the same time, it increased the fat content of the milk per volume as much as 20 per cent.

3. The cacao husk had little effect on the fat content taken as a whole, although this varied slightly, being sometimes greater and at others less.

The writer states that Faelli (*Moderno Zooiatro* 1898) obtained increased milk yield and fat content by feeding cacao husk; he considers that husks of much fermented cacao decrease the milk yield less than those of little fermented cacao, such as he used in his own experiments.

SHEEP

157 - Contribution to the History of Merino Breeding.

Schulte im Hofe, A. Zur Geschichte der Merino-Schafzucht. — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, No 50, pp. 690-692. Berlin, December 15, 1912.

1. *Introduction of Merinos into Europe.* — The Merino, whose origin is Asia Minor, travelled by Greece and Italy to reach Spain, whence it spread all over Europe. As early as the second half of the 15th century, Edward IV brought some 3000 Merinos to England from Spain, but did not succeed in permanently establishing them. There centuries later George III made further introductions, but the breed was again soon given up.

The first Merinos were introduced into France in 1659, but their distribution was limited. New attempts were made in 1752. In 1785 the King of Spain presented Louis XVI with 334 ewes and 42 rams, which formed the nucleus of the famous Rambouillet flock. Later, Spanish nobles presented the Empress Josephine with sheep from some of their best flocks.

Under Frederick the Great, in 1748, some Merino rams were imported into Prussia from Spain; in 1786 100 rams and 200 ewes were introduced. In 1802 400 rams and 800 ewes were imported and distributed among a large number of farmers. During the winter of 1815-16, 900 Merinos were taken from near Paris to Bornstedt near Potsdam; these sheep — 220 rams and 680 ewes — were the foundation of the Frankenfelde (Brandenburg) breed, which was later increased by further importations from France.

The first Merinos to be introduced into Saxony were 92 rams and 128 ewes in 1765. In 1779, 270 more were purchased from Spain.

The Empress Maria-Theresa had 300 Merinos brought from Spain to Hungary, and founded the Marcopail flock. In 1784 the Emperor Joseph brought over 1000 Merinos destined to found the flock of Mannersdorf in Austria, which was afterwards increased by the addition of 2000 others.

In Sweden, Merinos were introduced in 1715 and 1743.

2. *Introduction of wool-growing into Australia and other British Colonies.* The first Merinos were introduced into Cape Colony by a Colonel under the Dutch Government. In 1801 the number did not exceed 1000, while in 1806 it had reached 11000; in 1824, however, the number of fine-woolled sheep was down to 800 again. From this time the Boers undertook wool-growing, and on various occasions imported Merinos from England; recently they have obtained them from Australia. In 1816 the exportation of wool was

20 000 lbs., in 1832 66 000 lbs., in 1836 372 000 lbs., while in 1880 it had reached 46 000 000 lbs.

In the Transvaal and the Orange Free State, the breeding of fine woolled sheep, which was seriously upset by the war, has since looked up again, owing to importations from the Cape. The total exports from the Union of South Africa in 1910 amounted to 120 million lbs., with a value of £3 800 000.

John Mac Arthur was the first to see how well suited were the conditions in Australia for the breeding of fine woolled sheep. He crossed the wool sheep introduced by Captain Philipp in 1788 with 30 sheep imported from India in 1793 and others obtained later from Cape Colony. In 1804 Mac Arthur brought several Merino rams with him from England. From this period dates the development of sheep-breeding for wool in Australia. The number of sheep rose from 20 million in 1860 to 106 million in 1899, then fell to 53.7 million in 1902; in 1906 there were 71 million and in 1910 about 92 million, with a wool export of 792 million lbs., worth £30 000 000.

The breeding of fine-woolled sheep in New Zealand owes its origin to repeated importations of Merinos from Australia. The first year in which wool exports are mentioned is 1840; in 1858 the number of sheep had risen to 11 ½ million, and in 1910 to 24 million, with a wool export of 200 million lbs.

3. *Merinos in the Argentine.* — The first Merinos were introduced into the Argentine at the beginning of the 19 th century. In 1910 there were 67 million in the country, and the wool export reached 330 million lbs.

4. *Breeding of fine-woolled sheep in German Southwest Africa.* — In 1891 E. Hermann brought about 1500 sheep from the Cape to Kubub in German Southwest Africa to start wool-growing; but the flocks were several times nearly wiped out during native revolts. In 1908, however, their number was 11 000, and in 1911 32 000.

To allow breeding to develop rapidly it is essential to have springs sufficiently copious and persistent to establish fields of lucerne, so as to provide fodder in droughty years. The veterinary organization must be sufficient to prevent infectious diseases becoming plagues. In the large pedigree flocks there should always be enough breeding animals to suppy small farms. Again, larger importations from Australia must be made, and more capital must be devoted to this industry.

158 - Sheep-Breeding Experiments in Alaska.

Annual Report of Alaska Agricultural Experiment Stations for 1911, pp. 32 and 63-64 Washington, 1912.

From the experiments so far carried out at the Kodiak Experiment Station, it seems that sheep breeding may give good results on the south coast of Alaska. In 1910, the Station purchased 40 grade Lincoln and Cotswold ewes and a pedigree ram of each breed; the Lincoln was run with the flock and the Cotswold kept for other experiments.

Long-woolled sheep do best in the wet climate of Alaksa; the short close wool of Merinos and their crosses holds the wet, which seriously incommodes the sheep.

The sheep grazed on the mountains in the autumn and early winter of 1910. In the winter they were brought to the Station in excellent condition, and were kept on hay and silage for the remainder of the winter. By night and in bad weather they were brought into the barn, but otherwise were kept out in an enclosure. They wintered very well.

At lambing time (June and early July) in 1911, there were still 35 out of the 40 ewes, besides 20 lambs born in 1910. Three ewes died in the spring of 1911 from a too rapid change from dry feed to grass.

In the summer of 1911 37 lambs were born, and 31 of these lived and did excellently.

Alaka is attracting the attention of breeders from the United States; in 1911 one breeder imported 500 ewe tegs, and other importations are being arranged.

GOATS

159 - The Goat Shows in Goat Sheds Organized by the Chamber of Agriculture of Baden.

SAETTELI, J. E. Die Orts- (Stall-) Ziegenschauen der Badischen Landwirtschaftskammer. — *Zeitschrift für Ziegenzucht*, Year XIII, Nos. 19-20 and 21, pp 289-293, 310-313 and 327-329. Hannover, October 1 to November 1, 1912

On the initiative of the writer, the Chamber of Agriculture of Baden have adopted a plan for the improvement of goat-breeding in the Grand Duchy by means of goat shows held in the goat sheds. The whole stock of the goat breeder is judged at these shows according to a scale of points,

The manner in which the animals and their sheds are kept is also taken into consideration.

The scale of points is as follows:

I. — *For the animals.*

	No. of points
1. Breeding (fidelity to type, weight, descent, health)	0 — 3
2. Points (head, skin, hair, conformation of body, chest, width and depth of chest, back, belly, hips, limbs, general appearance)	0 — 3
3. Utility (good milking and fitness for breeding)	0 — 3
4. Evenness of all the stock	0 — 3
Total number of points for the animals	0 — 12

II. — *Points given for other matters.*

1. Condition (especially attention and feeding)	0 — 2
2. State of the sheds (hygienic)	0 — 2
3. Milk test records, stud-book keeping	0 — 4
Total of points for these matters	0 — 8

Prizes were given according to the verdict passed upon the animals: The prizes were:

	Prize I.	II.	III.
For male goats	10 s.	6 s.	4 s.
For female goats	8 s.	5 s.	3 s.

If the breeder receives a minimum of 5 points under scale II, an additional *6d.* for every such point can be added to the above prize.

In 1912, the first goat-show of this kind was held. In some cases, the animals were found to be badly fed and tended, but the writer hopes that these conditions will be improved, and he concludes by stating the best measures to be adopted for this purpose.

160 - Chicken-Rearing on an Intensive System.

POULTRY

The Journal of the Board of Agriculture, Vol. XIX, No. 9, pp. 721-725. London, December 1912.

An example of intensive chicken rearing is provided by a small holding near London worked by Mr. F. G. Paynter; the holding is a grass field of 3½ acres, on fairly light and well-drained soil. Eggs of table breeds were purchased and hatched in incubators. The chickens were kept in foster-mothers for the first six or eight weeks, and afterwards placed in runs up to the age of 12 or 16 weeks, when they were sold. The runs were 12 yds. × 100 yds., and held 100 to 120 chickens; in each run two small Sussex chicken "arks" provided sleeping accommodation; these were on wheels and could easily be moved about. Mr. Paynter adopted methods of rearing previously tested by him for five or six years, and incubation, attention and feeding were all carried out carefully and methodically. Only fresh material of the best quality was used for feeding, and no cramming was practised. The quantity of food consumed during the season was: wheat 10 978 lbs., fine sharps 7 888 lbs., biscuit meal 3 257 lbs., barley meal 1 827 lbs., meat meal and green bone 1 586 lbs., bran 1 224 lbs., maize 703 lbs., rice 370 lbs., oatmeal 359 lbs., and fat 28 lbs., also about 2 000 lbs. of mixed chicken feed.

It had been intended to start incubation in December, so as to sell the first consignments of chickens in April, when prices are good; but for various reasons it was delayed, and hatching did not begin till the 13th of February. Incubation was stopped in June.

Altogether 2 192 chickens were sold between May 28 and November 1, for a total of £301 5*s.* 3*d.* The expenses were as follows:

	£	*s*	*d*
Purchase of eggs (two to each chicken)	31	13	1
Purchase of day-old chickens	4	19	0
Oil for heating	4	12	9
Food	142	4	3
Occasional outside labour	14	6	2
Total . . .	£197	15	3

There was thus a margin of £103 10*s.* for the labour of the small hoder, rent, deterioration of equipment, risk and interest on capital; there was also the value of the manure, which was regularly swept up.

The cost of the incubators, fencing, houses and all utensils reached £150 odd; a further £50 to £100 would be required as ready money for purchasing eggs and food, before the returns began.

An essential feature of the management was that no adult birds were kept; this enables the holder to devote all his attention to the chickens, and greatly reduces the risk of outbreaks of infectious disease.

The Board of Agriculture has arranged with Mr. Paynter to carry on his system this year in Cheshire, as a demonstration to the small holders in that county.

161 - An Export Trade in Eggs. Views of the South African Trades Commissioner.

The Agricultural Journal of the Union of South Africa, Vol. IV, No 5, pp. 748-752. Pretoria, November 1912.

The imports of eggs into the United Kingdom for the year 1911 totalled over 19 000 000 great hundreds (120 eggs), value £7 967 555. The following are the figures in regard to the ten chief countries of origin.

Country	Quantities in great hundreds	Total values	Values per great hundred	
		£	s	d
Russia	10 041 890	3 796 408	7	$6^{1}/_{2}$
Denmark	3 992 986	2 030 607	10	2
Austria Hungary	1 022 554	428 869	8	$4^{3}/_{4}$
Italy	771 107	366 859	9	6
Egypt	687 335	222 853	6	$5^{3}/_{4}$
France	652 036	303 515	9	$3^{3}/_{4}$
Netherlands	607 364	282 805	9	$3^{3}/_{4}$
Germany	577 545	233 142	8	1
Sweden	344 289	157 067	9	$1^{1}/_{2}$
Morocco	214 960	84 967	7	$10^{3}/_{4}$

In 1911 the Cape of Good Hope exported to the United Kingdom twenty-two great hundreds of eggs which, however, realized 11 *s.* 10*d.* per great hundred, the highest price of any of the imported eggs. The average price *for the year* was about 8s. 4½d. per great hundred, the lowest being 5s. 4d. per 120 for Chinese eggs.

South Africa imports considerable quantities of eggs, but this import is practically limited to the months between February and August, so that it might be possible during the rest of the year to satisfy the home demand and to supply an export trade.

Eggs imported into the Union of South Africa during the year 1911.

	Quantity	Value
	—	—
		£
January	14 400	60
February	195 446	2 163
March	3 405 839	15 072
April	3 699 190	14 302
May	4 623 564	15 813
June	3 835 056	7 701
July	650 810	1 928
August	78 252	220
September	5 000	27
October, November, December	nil	nil
Total	16 807 548	£ 57 286

There are several large areas in South Africa where eggs and dairy produce can be produced cheaper than in other countries which export these articles. The reason why these commodities are not produced for export in South Africa is due chiefly to the difficulty of collecting (the population being very widely scattered) and of transporting them. All countries which export eggs are closely populated and often have to import food-stuffs. Still the advantages of a speedy and cheap collection are so great as to enable those countries to compete on the large markets of the world.

On account of the want of large markets, the South African agriculturists have had to confine their efforts to the production of non-perishable products such as wool, mohair, ostrich feathers, wattle bark, and lately maize. During recent years fruitgrowers have, with the aid of cold storage in ships, been enabled to export their fruit, and a high industry has thus been created. Trial shipments of butter have recently been made with satisfactory results. In the same way an export trade in eggs could be created during the period of the year when they are plentiful in South Africa. The question of collecting will probably be solved by the aid of co-operation.

The Union-Castle Steamship Company is disposed to carry some trial shipments of eggs from South African ports at 25s. per ton measurement, and poultry, in cold chamber, at 50s. per ton of space occupied.

Prices of eggs on the English market from November 1911 *to January* 1912

Country of Origin.	Price per 120 eggs		
	Average	Highest	Lowest
	s d	s d	s d
England.	17 11	23 0	11 6
Russia	9 $8^1/_2$	12 0	7 6
Denmark	15 10	22 0	10 6
Hungary	10 $0^1/_2$	11 9	7 6

For the English market the colour of the eggs, whether white or brown-shelled, is a matter of indifference, provided that they are of a uniform colour and size in each box. The eggs must be cleanly laid, *not washed*, and of a fairly good size and weighing from 13 to 16 lb. per trade hundred (120 eggs).

The writer has made himself acquainted on the English market with the best methods of packing eggs adopted by the chief exporting countries, and recommends the cases used for the import of eggs into South Africa. These are lined with brown paper tarred on one side, and very dry oat straw. The eggs are packed in layers of five rows of sixteen and seventeen alternately, embedded in dry oat husks. Between each layer of eggs and the next one there is a double sheet of newspaper, oat straw and more newspaper. Four layers of eggs form a case. The writer recommends placing a double division in the middle of the cases so that they can be divided by sawing into two half cases which are sold to small dealers.

BEES

162 - Mendelian Methods applied to Apiculture.

SLADEN, F. W. L. in *The Canadian Bee Journal*, Vol 20, No 12, pp 357-367 Brantford, Ont., Canada, December 1912.

The study of Mendelism in the bee is hampered by several special difficulties. Firstly mating cannot be controlled in the ordinary way. Then there is the parthenogenetic production of the drone. Thirdly the honey-bee is a highly specialized animal, and varies very little. There is some variation in size, the eastern races being smaller than those of the west, but apart from this the colour of the upper or dorsal side of the abdomen is the only visible character that varies strikingly.

In the workers in *Apis indica*, in the Abyssinian bee and in the artificial varieties known as golden bees, the yellow extends over the three basal segments and more or less of the basal part of the fourth segment. The scutellum on the posterior part of the thorax is also yellow. Extreme goldens, with the fourth segment entirely, and the fifth segment more or less, yellow have also been bred, but it appears that they do not breed true. In Italians the three basal segments are bordered at the edges with black and the scutellum is darker. Italians from the Swiss Alps have the black bands wider than the Italians from the Ligurian Alps, while Cyprians have them narrower. Races with the abdomen entirely black occur in Britain, France, Germany, Malta, and other places. For some years the writer has been engaged in breeding a golden bee known as the British golden bee. This bee was extracted from crosses between English blacks, Italians and American goldens. The golden character was soon isolated, and thenceforward it was found possible to maintain the pure golden breed, though many of the queens were mated with blacks and produced hybrids. No attempt was made to increase the area of the golden colour, which in the queen extends much further back than in the worker. The factor or factors that produce a half yellow and half black abdomen in the worker produce an almost entirely yellow one in the queen. There is no difference in the gametes; the difference is merely a fluctuation in the zygote caused by a difference in the food supplied in the larval stage. Since the work of breeding British goldens began in 1902 a large number of pure golden queens have been bred; about 1500 of them were kept until their young workers were hatched, and notes were made of the colouring of these. They were golden and intermediate. Not a single black worker was seen. Most queens produced a considerable proportion of each type, but some produced all goldens, and some all intermediates.

It was evident that the queens that produced all goldens had been mated by a pure golden drone; in fact the most numerous golden families were from the matings that took place at the end of each season, when most of the drones in neighbouring apiaries had been killed off, and from the matings that took place in cold and windy weather and therefore close to the apiary.

It was also reasonable to believe that the intermediates were the result of the union of the golden queens with pure black drones (out of five queens mated at a spot nearly two miles from the apiary four produced all intermediates and one about nine intermediates to one golden). Without doubt the queens that produced goldens and intermediates had mated with heterozygous drones. The proportion of the two types of workers varied considerably: from

Intermediates : golden : : 9 : 1 (one case)
Intermediates : golden : : 1 : 30 (one case)
A common proportion was
Intermediates : golden : : 3 : 7, perhaps 1 : 2.

The proportion of goldens to intermediates has been found to be the same in the queen progeny as in the worker progeny.

The worker offspring of about 30 of these intermediate queens were examined and in every case they consisted of goldens, intermediates and blacks, thus proving that segregation of golden from black takes place. The proportion of the three forms varied in different cases, but the intermediates were usually in excess of the goldens and the blacks. In many cases almost every degree of coloration between golden and black appeared, but the bees of the same shade were in different proportions in the various offspring.

The interpretation of the results obtained is rendered difficult through not knowing the drone fathers. Nevertheless they indicated Mendelian inheritance. The appearance of an almost continuous series of intermediates shows that probably more than one factor is here at work.

As a conclusion of practical value, it appears from the foregoing that if the characters that are wanted depend upon the heterozygous nature of the heterozygotes, the way to get them is to breed together the two pure homozygotes. Thus from the union golden × black all intermediates are got, whereas from the union intermediate × intermediate only a proportion of intermediates are obtained.

The union between golden queen and black drone is practically attainable on a large scale, and their offspring possesses certain qualities that are very desirable. The workers show themselves vigorous, hardy and industrious ; the intermediate is considerably larger than the golden (in both queen and worker) and slightly larger than the black. The colonies are very populous, the golden queens being more prolific than the black ; their temper is usually good, though it becomes hotter in later generations when the black colour predominates.

As it is not possible in the case of bees to control matings by means of isolation, the only way of obtaining desirable characters seems to be fixing them by selection in the queens. A desirable character may appear not in the queen but in the worker (for instance, exceptional industry). For such characters the colony must be considered as the unit.

It is generally admitted that the drones are produced parthenogenetically and it is proved that a queen which has not been fertilized produces drones only. But are *all* the drones produced by a *fertilized* queen the result of parthenogenesis? Perez in 1878 thought not, because on examining 300 drones produced by an Italian queen fertilized by a French black drone he found 149 which he thought indicated hybridism.

If it is true that drones are always produced parthenogenetically, the queen, provided her gametes be pure, must produce pure drones, no matter what kind of drone has fertilized her. The writer has bred drones from about half-a-dozen of his golden queens every season for some years. Some of these golden queens were producing only golden workers, some produced certain proportions of intermediates, others only intermediates. The drones from the queens producing all golden workers were all golden, as were also the drones from most of the queens producing some or all intermediate workers, but two of these queens produced certain proportions of darker drones.

In trying to explain this remarkable result one is apt to suspect that the queen was not producing pure golden gametes, but the facts that the queen had the scutellum and the abdomen almost to the tip yellow, and that a queen thus colored had never been known to produce a black worker, oppose this view. In conclusion the writer does not consider that this observation seriously endangers the theory that the drone is always produced parthenogenetically, but is of opinion that cases such as this should receive the fullest investigation.

In Italian bees, the workers all come perfectly true to a color pattern very like that of the cross between English golden and black, while the queens, on the contary, show immense variation. The question arises, are these differences in the queen mere fluctuations or do they stand for factors in the gametes which do not manifest themselves in the workers?

It would be interesting to ascertain if Mendelian rules are followed in the inheritance of the bands of short white hair, which, in the Italian bee of Carniola, is highly developed on each segment, except the first and the last, and which is but feebly developed in the English black bee.

Italian bees enjoy justly a world-wide fame, but in England, owing to the summer climate not being warm enough for them, the Italian-English half-breds usually produce better results. One of the best qualities of Italians is their resistance to the disease known as European Foul Brood (1), and it would be well worth while to try to discover whether this quality is shared by the Italian-English half-breds. A strain might perhaps be bred to resist that still greater scourge the Isle of Wight Disease (2).

163 - Notes on Bee-keeping in Australasia.

HARDWICK, L. L. in *The Agricultural Journal of South Africa*. Vol. IV, No. 5, pp. 745-747. Pretoria, November 1912

This paper is the result of data and information collected during a journey in the Commonwealth.

The first thing that struck the writer was the huge "takes" of honey in Australia, no less than 200 lbs. being considered as fair, and this where up to 500 colonies are kept. The chief nectar producing plants are the various gum and boxwood trees. Experience has shown that Leather Colour and Golden Italian bees have been found to be the best suited to the requirements of the bee keepers, and large numbers are reared annually; as much as 15*s*. is paid for a select tested queen of this variety. In New South Wales the hive which has practically been adopted as the standard is the Longworth. In Victoria an Act has been passed, coming into force on the 1st of January 1913, prohibiting the keeping of bees in anything but moveable frame hives. A similar law was enacted in New Zealand six years ago, the Apiaries Act, 1907, requiring every bee-keeper to give notice to the Secretary for Agriculture of any disease found to exist in his apiary; a visit is then paid by an inspector, who either orders that the diseased colonies be destroyed or leaves instructions for their treatment. Within six months of the passing of this Act no bee-keeper was allowed to keep his bees in other than frame hives, and further, should the inspector discover a hive where the frames could not readily be removed, he has the power to order that the bees be transferred to another hive within a specified time. By this means they hope in time to get rid of foul brood and other bee diseases.

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(1) See No. 1202, *B*. Aug.-Sept.-Oct. 1912 (*Ed.*).

(2) Caused by *Nosema Apis*. See No. 1849, *B*. Aug.-Sept.-Oct 1911. (*Ed.*).

Large extractors carrying six and eight frames are in general use, and larger ones driven by small engines are also made. A firm in New South Wales has patented a machine to dispose of the cappings. It is really one tank inside the other, the space between being occupied by water kept at the proper temperature by a paraffin stove placed underneath. The cappings, as they are cut from the frames, fall on to a grating and then to the bottom of the inner tank, where the wax melts and flows out by the adjustable outlets, the upper of which delivers only pure wax, which is lighter than the honey and other impurities.

The honey is put up in tins ranging in size from 1 lb. up to 60 lbs. Tins of 56 lbs. are generally used for export. The wholesale price for honey in Australia in 56 lb. tins is usually about 2 3/4 *d.* per lb., but even at that figure apiarists are able to make a good living out of bee-keeping.

To provide an outlet for such large quantities of honey, the Government instituted a Co-operative Union in which the farmers have shares. The Union, besides honey, receives also other produce for export. The farmer delivers his produce at the stores and at the same time receives the wholesale market price, less a small commission for working expenses. The Union controls the market, securing supplies when they are wanting and preventing overstocking.

In Victoria, a strong association known as the "Victoria Apiarists Association" exists, the special function of which is the holding of an annual conference. The executive have recently been successful in obtaining reduced railway charges for honey and bee appliances over the Victorian Railways.

In Victoria a disease has been discovered, which appears to be limited to that State and which has been termed D. T. or "disappearing trick". It is believed to be due to malnutrition of larvæ, bee paralysis, and *Nosema apis.* As the name suggests, the bees disappear rapidly, but no more dead bees are found round the hives than would be found around any healthy stock.

The other bee diseases known in Australasia are foul brood and paralysis, but these cannot be described as being very prevalent.

164 - The Fungi of the Bee-Hive.

BETTS, ANNIE, D.: *The Journal of Economic Biology*, Vol. 7, No. 4. pp. 129-162. London, December 1, 1912.

A short account is given of the previous work that has been done, from 1854 to 1912, on the fungi present in bee-hives; and some questions arising from these records are discussed. A general description of the conditions prevailing in the hive, and of the distribution of fungous growth in it, are given. The following twelve fungi are described and illustrated:

Probably confined to the hive: *Pericystis alvei, Oospora favorum* (not a common species).

Adapted to hive-life, but not confined to this habitat: *Gymnoascus setosus*; *Eremascus fertilis* (not common).

Common, but not specially adapted to life in the hive: *Penicillium crustaceum, Aspergillus glaucus, Citromyces subtilis, C. glaber, Mucor erectus* (chiefly, if not exclusively, found on dead bees).

Occasionally present: *Aspergillus nidulans* (probably absent from healthy stocks); *Sordaria fimicola* and *Gymnoascus ruber* (coprophilous).

The literature cited, including 30 papers, is appended.

165 - Fish-Breeding in the Streams of the Domanial Forests of Hungary.

FISH

SIMONFFY, GYULA. A-m. kir. kincstári erdöségek halasvizei. — *Erdészeti Lapok*, Year LI, Parts XIX, XX, XXI, XXII and XXIII, pp. 779-799, 834-853, 898-908, 934-939 and 970-976. Budapest, October 1 and 15, November 1 and 15, December 1, 1912

In Hungary, most of the domanial forests are situated in the west and north of the country; there are also the principal groups of plain forests (Alföld). According to the ministerial report of 1910, the area under the forest administration amounts to 3 214 853 acres. Under the natural conditions obtaining in Hungary, which is very well supplied with water, the streams form a large network within these estates and the profits derived from the fish, etc., which are under the charge of the forest fiscal administration, form an important part of the revenues of the State.

According to the data collected by the Ministry of Agriculture, the whole of the area belonging to the Treasury which can be employed for fishery purposes is 43 493 acres. The streams which are known and classified have a total length of more than 3000 miles. The area which they water is administered by 124 forestry officials. The right of fishing in this territory does not belong exclusively to the Treasury, but is shared also by the owners of properties adjoining the streams. As the Treasury possesses the right of fishing both on the plain and in the mountain streams, the fish over which it has control include all the species which usually inhabit fresh water in Hungary, notably the following species: perch (*Perca fluviatilis*), pike-perch (*Lucioperca sandra*), *Aspro communis*, ruff (*Acerina cernua*), miller's-thumb (*Cottus gobio*), *Cobius marmoratus*, burbot (*Lota communis*), carp (*Cyprinus carpio*), Prussian carp (*Carassus vulgaris* and *C. gibelio*), tench (*Tinca vulgaris*), barbel (*Barbus fluviatilis*), Petény barbel, gudgeon (*Gobio fluviatilis*), bitterling (*Rhodeus amarus*), bream (*Abramis brama*), bleak (*Alburnus lucidus*), *Idus jeses*, roach (*Leuciscus rutilus*), minnow (*Phoxinus laevis*), loach (*Cobitis barbatula*), *Chondrostoma nasus*, sheatfish (*Silurus glanis*), grayling (*Thymallus vulgaris*), trout (*Salmo fario*), salmon (*S. salar*), shad (*Alosa vul-

garis), eels (*Anguilla*), sturgeon (*Acipenser sturio*) and lampreys (*Pteromyzon*).

The number of fish in the streams varies according to the prevailing conditions ; as a rule there are few and in some streams none. The cause of the decrease is chiefly a too great extension of fishing rights. In the face of these regrettable circumstances, the forestry administration shows a commendable activity, devoting its whole care and efforts to the subject of fish-breeding. There are at present 37 establishments for the artificial incubation of trout eggs ; these institutions work under the direction of the administration of the domain and are mostly furnished with Californian apparatus, the number of the latter being 279. In addition, there are 6 breeding ponds for rearing trout fry, which remain there throughout a summer. Thanks to these measures 1 470 000 eggs of river trout and rainbow trout have been hatched in the above-mentioned apparatus in the course of the year, and from these, 972 000 young fish were transferred to the ponds.

It should be noticed, that the administration of the Domain is greatly supported by the Royal Fishery Inspection, which has its seat in a Bureau attached to the Ministry of Agriculture. This bureau has fixed the localities for the establishment of Stations for artificial incubation, and of breeding ponds, and has distributed gratuitously the incubation apparatus and the trout eggs. The cost of these installations under the administration of the domanial forests is about £833, estimating the average expense of building the stations and making the ponds at £16 10*s*. each, and that of the apparatus at 8*s*. 4*d*. each. The whole number of eggs which have recently been hatched artificially represents a sum of £25, reckoning 3*s*. 4*d*. per thousand eggs.

The streams of the Royal Domain are turned to account in different ways. Most of them are let with the land, but some of them are not used; sometimes the fishing rights are let with the shooting.

Fish and fishing licences bring in annually the sum of £2250 for 37 650 acres. Nevertheless, seeing that of all the domanial land watered by streams, 5841 acres are at present not utilized, and that their utilization would greatly increase the revenue, it would be interesting to know the value they represent. In order to make this estimate, it is necessary to classify the extent of these streams according to the principal regions where the different fish are found :

	Area in acres	Actual revenue per acre
1. Bream district	33 021	2*s*. 1*d*.
2. Trout district	5 345	1*s*. 11*d*.
3. Barbel district	5 127	8½*d*.

Thus if these streams were utilized and the average rent of such streams was obtained, which is taking the minimum sum, in this case the revenue from the streams of the Domanial forests would be :

	£
Streams with bream	3483
Streams with trout	517
Streams with barbel	180
Total	£4180

The annual return from trout streams is very variable. According to the data collected by each of the Central Forestry Bureaus, it varies between 3*d.* and 5*s.* 7*d.* per acre. Taking these figures as a basis, it is clear that these trout streams might bring in an additional sum of from £70 to £1460. The following calculations show how the revenue from the trout streams could be increased.

It is well-known that, under normal conditions (presupposing some attention being paid to the streams and their stock of fish) a stream of one acre can produce from 23 to 39 lbs. of trout. Taking 2*s.* per lb. as the minimum sale price of the fish, the net revenue from one acre of water would average about £3; thus the revenue of the 5345 acres of trout streams would be about £16 000; this sum could even be increased in a few years, if the Administration continued its present exertions in promoting and extending systematic breeding of fish.

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

166 - Trial of a Dodenhof-Meyer Manure Distributor.

REZEK, JOS. Prüfung eines Düngereinlegers System Dodenhof Meyer. — *Wiener Landwirtschaftliche Zeitung*, Year 62, No. 100, p.1151. Wien, December 14, 1912.

Two manure distributors on Dodenhof-Meyer's system were sent to be tried. One was provided with an interchangeable plough-share, which the other lacked. Their weight was 12 lb. 2 oz. and 11 lb. respectively. They consist of a screw-shaped steel plate with a shaft by means of which the apparatus is fastened to the beam of the plough instead of the coulter. Its action consists in rubbing the fertilizer into the furrow made by the plough.

From the experiments made it appears that the apparatus increases the resistance to traction of the plough by 44 to 57 lbs.

The quality of the work performed was excellent in every trial. The manure was completely and uniformly ploughed in, and it seems that the apparatus will also be useful in dealing with green manures.

167 - Tapping Rubber Trees by Electricity.

The India Rubber World, Vol. XLVII, No. 3, pp. 142-143 + figs. New York, December 1, 1912.

George M. von Hassel has devised an apparatus for tapping rubber trees by electricity. Upon the trunk of the rubber tree is placed a piece of sheet-iron about 5 ft. long, 5 in. wide, with the two sides folded back against the tree to a thickness of about 2 inches, constituting a hollow channel of sheet-iron. This hollow channel is divided into a series of 15 to 30 sections; the number of sections depends upon the number of days the apparatus is to be worked. Each section has a mechanism for the extraction of the latex from the rubber tree and a receptable for receiving the flow, which also contains an acid preparation for the coagulation of the latex. When working *Hancornia* and *Castilloa* trees, plates provided with longitudinal canals, in which the latex coagulates spontaneously in threads, are used instead of the receptacles for gathering the latex, and the product thus obtained is known as "Sernamby."

The method of operating is as follows: The above described device is fastened against the rubber tree. If it is a small tree there will be two of them; if it is a large one there may be as many as nine circling the tree and about a hand-span apart. This apparatus is connected by an insulated wire with similar apparatus on all the other trees to be tapped and with a central station which is equipped with electric power. A machine devised by the inventor makes it possible to send the electric current so that it will set each section in motion separately. When the first section is at work the latex oozes out and flows into the receptacle immediately beneath. The next day — or preferably 48 hours later — the current is turned on to the second section, which in its turn taps the tree and so on for all the sections. After 30 or 60 days nothing remains to be done but to collect all the rubber at one operation.

168 - Spraying Machines in Malaysia.

ALEXANDER, D. C., Jr in: *Daily Consular and Trade Reports*, 15th Year, No. 284, p. 1113. Washington, December 3, 1912.

There is a large market for spraying machines in the Federated Malay States, and the writer believes that there is also a good demand for the same machines among the rubber growers in Java, Sumatra, and Ceylon.

On practically every rubber estate in the Federated Malay States several spraying machines are in constant use, both for spraying the rubber trees and for spraying and killing the lalang grass, or weed. This grass, which seems to spring up as soon as the jungle is cleared, sinks its roots so deeply as to interfere seriously with the root nourishment of the young rubber trees. Indeed most planters consider lalang their greatest enemy, and large sums are spent annually in combating it.

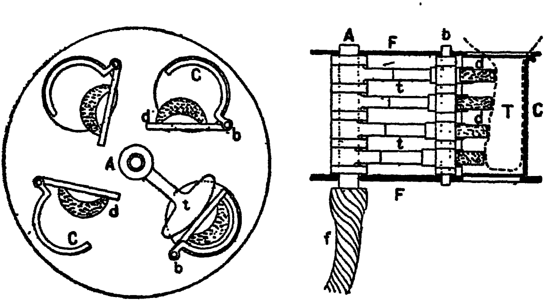
When the young trees are set out they are spaced about 20 ft. apart, and the lalang is dug out along the lines with "chukohs" (hoes). When once the trees are fairly started, spraying with a herbicide is usually substituted for the more expensive hoeing, though the usual chemicals applied do not kill the roots and have therefore to be applied at frequent intervals. The herbicide most generally used is arsenite of soda.

Two or more types of spraying machines are used on the rubber estates. The larger ones, for tree work, are mounted upon small trucks drawn by horses or coolies. For spraying lalang, the most popular machine is a knapsack, as it can be used by a coolie upon steep hillsides where a truck could not go.

169 - A Milking Machine at the Central Competition at Amiens.

COUPAN, G. Une Machine à traire au Concours Central d'Amiens. — *Bulletin de la Société des Agriculteurs de France*, December 1, 1912, pp. 378-379. Paris, 1912.

At the last Central Agricultural Competition held at Amiens, the Paris firm "la Galakton" showed a milking-machine of which the principle is diagrammatically shown by our figure. The apparatus is almost in the shape of a flat cylindrical box, of which the top and bottom are formed by two plates F, each furnished with four large holes arranged in the same manner as the teats on the cow's udder. Between the plates and perpendicular to them, are four hollow half-cylinders, C, of aluminium, against the concave surfaces of which the teats are placed; to extract the milk, each element C is provided with a series of four or five metallic fingers, *d*, each ending in a thick cushion of rubber; the fingers move on an axis *b*, parallel to C, from which it is held away by a spring. In the centre of the apparatus, there is an axis A, which is revolved by a flexible tube *f* connected with any part of a machine with a rotatory movement; this axis A bears four or five rods, *t*, which during the rotation push successively each of the fingers of the milking elements C. As shown in the right-hand portion of the figure, these different fingers are not superposed exactly one over the other, but are slightly out of line, so that the one at the highest level works first, and the others rapidly follow it one after another. Thus the teats in the half-cylinders C are first compressed near their insertion on the quarters, then progressively from top to bottom, towards their extremities; this process extracts the milk without any need of mechanical suction. There are also fairly simple adjustments for the adaption of the machine to differently shaped udders, and a harness, rapidly adjusted to the animal, supports the machine while at work.



170 – Testing the Wallace Milking Machine.

HANSEN. Prufung der Wallace-Melkmaschine — *Wissenschaftliche Rundschau*, Nos 13-14, pp. 49-56 Supplement to *Georgine, Land- und Forstwirtschaftliche Zeitung*, Year 5, No 100 Konigsberg, December 14, 1912

During six months, Dr. Hansen has been making experiments with the Wallace milking-machine at the Agricultural Institute of the Albertus University at Königsberg; the results obtained are incorporated in the following report.

The writer first gives a description of the apparatus and the method of working the machine. Then he proceeds to a description of the experiments and discusses the data obtained.

The experiment lasted from October 3, 1911 to April 4, 1912. Thirty different cows were experimented upon . None of the animals showed any objection to being milked by the machine. The first few days, it was not possible to milk the cows dry, but already on the fifth day, the strippings obtained by hand were only 4 oz. per cow, not even 2 per cent. of the total amount. In the week of October 13-19, the strippings from 119 milkings amounted to from 0 to 8 oz. in 108 cases, and to more in 11 cases. It is very important that the udder of the cow should be rubbed at the close of machine-milking; by this means the cow can be milked dry by the apparatus.

The strippings, obtained by hand after using the machine, show a higher fat-content than that of the rest of the milk. The average proportion is 2:1; thus milking dry is of great importance. Of 210 milkings in the week of November 23 to 29 the strippings obtained by hand were in 162 cases from 0 to 3½ oz., in 23 cases from 4 to 5 oz., in 4, from 7 to 8 oz.; but in the four last cases 11, 14, 18 and 21 oz.

The milking machine has no bad effect upon the amount of milk or on the fat-content. If the strippings are not removed by hand, the quantity appears at first slightly to decrease; the cow however recovers its full milking powers after a few days, when it has become accustomed to the new conditions.

It is an important fact, that in isolated cases the strippings are considrable and that usually the preceding and subsequent milkings are satisfactory. The cows depend somewhat upon the stripping by hand, but they yield the milk regularly when this supplementary process is omitted. Machine-milking was practised exclusively from January 10 to April 14 1912 and no diseases of the udder made their appearance; also in no case was a rapid fall in the milk yield noticeable.

One person can work three machines at once and is able to obtain from 400 to 450 lbs. of milk from 20 cows in an hour.

For the apparatus to work well, it must be kept scrupulously clean, which entails absolute cleanliness in the cow-shed; further, the animals themselves must be rightly handled.

According to the writer, hand-milking with really good operators is however the ideal method, for a good milker is able to treat each cow individually. But skilled and conscientious persons can milk a cow thoroughly, even with a machine, and up to a certain point, not lose sight of the individual requirements of each animal.

The Wallace milking-machine is therefore much to be recommended for dairy work; its performance is equal to the work of the average milker, and far superior to that of an inferior operator.

RURAL ECONOMICS.

171 - The Standing Working Capital in one Hundred Farms in Silesia.

RURAL ECONOMICS

SCHULTE-BARUMINGHAUS. Das stehende Betriebskapital in hundert landwirtschaftlichen Betrieben Schlesiens. — *Veröffentlichungen der Landwirtschaftskammer für die Provinz Schlesien*, Part 10, pp. 1-30. Breslau, 1912.

Availing himself of the abundant material at his disposal, the writer has determined in this paper the amounts of living and dead stock which a number of Silesian farms show in their inventories and has drawn the conclusions that result from the averages of these figures.

The material was supplied by the book-keeping bureau of the Chamber of Agriculture for the province of Silesia. The inventories of all the hundred farms here considered were drawn up by the writer himself.

In the first part the principles adopted by the book-keeping bureau in the valuation of the agricultural inventory are set forth, so far as they extend to the so-called standing capital, which comprises the live and dead stock inventory.

In the second and third parts the writer has shown by figures the influence that the intensity of farming, the size of the farm and the distance from the railway have on the amount of living and dead stock in the inventory; he has further determined the ratio of the numbers of draught stock and of productive stock, as well as the figures of the total dead stock referred to one unit of draught stock.

From the annexed table, in which all the averages found by the writer are collected, the following results are obtained.

1) The average number of head of all live stock expressed in head of large cattle amounts to 21.27 per 100 acres, worth £320 2*s*. 6*d*.

2) The average number of draught stock amounts, per 100 acres, to 4.21 head, worth £88 7*s*. 6*d*.

3) The average number of productive cattle, expressed in head of large cattle, amounts per 100 acres to 12.46 head, worth £189 17*s*. 6*d*.

4) As the farming grows more intensive the average number and value of the whole live stock, and especially of draught animals, increases.

5) The number and value of the whole live stock diminishes with the increase of the size of the farm (the diminution in draught animals being the least).

6) With the increase of distance between the farm and the railway the average number of draught animals diminishes slightly.

7) The average number of draught animals is 46.54 per cent. of the number of productive stock, and 27.60 per cent. of the total live

Average standing working capital on 100 farms in Silesia.

Class of farm	Total live stock (in head of large cattle) per 100 acres. Number	Total live stock (units) on 100 acres. Value	Draught stock (units) on 100 acres. Number	Draught stock (units) on 100 acres. Value	Total dead stock on 100 acres. Value	Productive cattle on 100 acres. Number	Productive cattle on 100 acres. Value	Total dead stock corresponding to 1 unit of draught stock. Value
		£ s d		£ s d	£ s d		£ s d	£ s d
All the 100	21.27	16 0 1	4.24	4 8 4	7 3 7	12.46	9 9 11	— 13 10
Yield up to 200 marks per ha. (£ 4 per acre)	17.42	12 1 10	3.31	3 2 0	5 10 9	—	—	—
Yield between 200 and 500 marks per ha, (£4 and £10 per acre)	20.99	15 4 7	4.23	4 7 8	7 1 3	—	—	—
Yield above 500 marks per ha. (£10 per acre)	27.38	22 3 3	5.46	6 4 11	8 16 2	—	—	—
Size I, up to 250 acres	29.80	22 3 7	5.78	5 7 6	12 9 3	—	—	—
Size II, 250 to 625 acres	23.77	18 1 1	4.40	4 17 4	7 15 3	—	—	—
Size III, 625 to 1000 acres	19.20	14 12 8	4.08	4 3 11	6 10 11	—	—	—
Size IV, 1000 to 1500 acres	17.52	22 19 2	3.78	3 15 4	6 1 4	—	—	—
Size V, above 1500 acres	16.16	10 9 11	3.76	3 3 3	3 8 4	—	—	—
Distance from railway up to 3 km. (1.8 miles)	—	—	4.28	4 15 8	—	—	—	—
Distance from railway 3-6 km (1.8-3.6 miles)	—	—	4.38	4 9 2	—	—	—	—
Distance from railway over 6 km. (3.6 miles)	—	—	3.97	3 16 6	—	—	—	—

stock in the inventory, while the whole productive stock is 59.32 per cent.

8) The value of total dead stock per acre of cultivated area is £1 8*s.* 9*d.*

9) The average value of the dead stock diminishes with the extent of the cultivated area.

10) The average amount of dead stock increases as the farming becomes more intensive.

11) The amount of dead stock corresponding to each unit of draught stock is £34 5*s.*

12) The average value of the whole of the dead stock is 44.88 per cent. of that of the whole of the live stock in the inventory.

172 - Wages of Farm Labour in the United States.

HOLMES, GEORGE, K.: *Nineteenth Investigation, in* 1909, *continuing a Series that began in* 1866. — *U. S. Department of Agriculture, Bureau of Statistics - Bulletin* 99 Washington, November 1912.

The present report contains the results of 19 different investigations into the conditions of agricultural wages in the United States and reaches back to 1866, in which year, for the first time, the average rates of wages in the United States were scientifically determined. The writer gives first a summary of the information he was able to obtain concerning the condition of agricultural wages previous to 1866. Most of this information was found in the works of the statistical bureaus of the various States, in old crop reports, and in the old year books of some farms.

They rarely afford average rates of wages, but only the wages of certain kinds of agricultural labour. From the above summary it appears that agricultural wages in the second half of the eighteenth and in the first half of the nineteenth century were relatively high in the United States, and further that economic disturbances, such as those caused by a war, exert a great influence on the rates of wages.

After some explanations on the method followed in calculating the average rates of wages, the writer gives tables of the average wages from 1866 to 1909 and for the several States, for the geographical divisions of the United States, and lastly for the whole of the Federal territory.

The monthly wages for male labourers which are engaged by the year, without board, were lowest in the South Atlantic States and highest in the western States; the average figure for the United States was $15.50 (£3 3*s.* 9*d.*) in 1866; it rose then to $17.10 (£3 10*s.* 4*d.*) in 1875, it fell to $16.79 (£3 9*s.* 1*d.*) in 1878 and rose continually till 1909 when it reached $25.46 (£5 4*s.* 9*d.*) When board was supplied the western group of States still returns the highest figures, namely $31.30 (£6 8*s.* 9*d.*), then follow the northern central States with $22.22 (£4 11*s.* 5*d.*), the north Atlantic States with $20.73 (£4 5*s.* 3*d.*), the southern central States with $14.25 (£2 18*s.* 8*d.*) and the south Atlantic States with the lowest rate of wages: $13.10 (£2 13*s.* 11*d.*).

When the labourers were hired only for the season the average wages, with board, for the United States were in 1866 $12.69 (£2 12*s.* 3*d.*), in 1869 $12.65 (£2 12*s.* 0½*d.*), in 1875 $13.53 (£2 15*s.* 8*d.*), and in 1909 $20.80 (£4 5*s.* 7*d.*). In this year the corresponding wage in the western States was $35.32 (£7 5*s.* 4*d.*), in the northern central States $25.42 (£5 4*s.* 7*d.*), in the northern Atlantic States $24.56 (£5 1*s* 0½*d.*), in the southern central States $16.57 (£3 8*s.* 2*d.*), and in the southern Atlantic States $15.13 (£3 2*s.* 3*d.*).

When for the calculation of the average monthly wages, the wages of the labourers engaged by the year together with those hired only for the season are used, the following are found : For 1891 in the whole of the United States $13.48 (£2 15*s.* 6*d.*). During the industrial crisis of the nineties wages fell, but rose again to $13.90 (£2 17*s.* 2*d.*) in 1899, to $15.51 (£3 3*s.* 10*d.*) in 1902, $18.75 (£3 17*s.* 2*d.*) in 1906 and $20.01 (£4 2*s.* 4*d.*) in 1909.

According to the reports of the Inland Revenue the total amount of agricultural labourers' wages rose from $357 391 930 (£73 513 733) in 1899 to nearly twice as much, namely $651 611 287 (£136 769 951), in 1909. If it be considered that the average rate of wages had risen only by about 30 per cent. and that the number of labourers has certainly not doubled within the 10 years, the great increase in the total can only be explained by assuming that the time during which agricultural labourers are engaged in the course of the year has of late years considerably increased. The average amount of wages paid per farm was $62 (£13 0*s.* 3*d.*) in 1899 and $102 (£21 8*s.* 2*d.*) in 1909.

The average daily wage for harvest work, board being given at the same time, amounted in 1866 to $1.04 (4*s.* 5*d.*) and rose in 1875 to $1.18 (4*s.* 10*d.*) . It then fell and rose reaching $1.20 (4*s.* 11*d.*) only in 1881, after which it sank to $0.96 (3*s.* 11½*d.*) in 1895 and rose again to $1.23 (5*s.* 1*d.*) in 1902 and $1.43 (5*s.* 11*d.*) in 1909. The highest daily wages were $2.02 (8*s.* 4*d.*) in the western States in 1909, the lowest $1.03 (4*s.* 3*d.*) in the south Atlantic States. The average daily wages for other than harvest work in the United States were $0.64 (2*s.* 8*d.*) in 1866, $0.68 (2*s.* 10*d.*) in 1875, $0.70 (2*s.* 11*d.*) in 1881; they remained about stationary till 1898 and then rose in 1899 to $0.75 (3*s.* 1*d.*), in 1902 to $0.83 (3*s.* 5*d.*) and to $1.03 (4*s.* 3*d.*) in 1909.

For the whole Federal States the average monthly wages rose from 1866 to 1909 by 78.9 per cent. for hands engaged by the year, and by 63.9 per cent. for those hired only for the season. The daily wages for harvest work rose from 1866 to 1909 by 37.5 per cent. and for other work by 60.9 per cent.

The oscillations in the rates of wages are illustrated by a diagram which shows at a glance that the industrial crises of the seventies and of the nineties depressed agricultural wages, which rose considerably from 1890 to 1908.

The writer remarks further that the wages in money do not represent the whole earnings of the agricultural labourers, who often get supplements in the shape of supplies in kind or of the use of dwellings, stables, gardens, pastures, etc. These supplements are valued very differently according to circumstances, in the several States and even in various parts of the same State. The monthly value of a dwelling house and garden is estimated at $1.75 to $5 (7*s.* 2½*d.* to £1 0*s.* 7*d.*) when the labourer gets board also, and $1 to 4.50 (4*s.* 1½*d.* to 18*s.* 6*d.*) when he does not.

The average value of the forage for a cow, a horse, a pig, or for poultry is set down at $1.11 to 3.11 (4*s.* 7*d.* to 12*s.* 9½*d.*) per month. The average monthly value of pasturage for a cow, a horse or a pig amounts to $0.65 to 1.61 (2*s.* 8*d.* to 6*s.* 8*d.*). Wood for fuel and the use of the team to fetch it is considered equivalent to $1.06 to 2.39 (4*s.* 4*d.* to 9*s.* 10*d.*) per month.

Between 1890 and 1907 the wages of agricultural labourers rose much more than those of hands engaged in the industries. The average figures of the latter between 1899 and 1907 are 11.20 per cent. higher than those between 1890 and 1898, while among agricultural labourers the corresponding increase is 21 to 26.6 per cent.

The value of the labourer's board was estimated at $5.41 (£1 2*s.* 3*d.*) per month in 1866, at $6.20 (£1 5*s.* 6*d.*) in 1880, and at $7.41 (£1 10*s.* 6*d.*) in 1909. In the case of daily wages at harvest time the value of the food was considered to be $0.30 (1*s.* 3*d.*) in 1866; during the industrial crisis of 1894 it fell to $0.21 (10½*d.*) and rose to $0.28 (1*s.* 2*d.*) in 1909. During the rest of the year it is valued $0.02 to 0.03 (1*d.* to 1½*d.*) less per day.

In 1866, the daily wages for harvest work were, on average, paid $0.44 (1*s.* 10*d.*) more than for other farm work; in 1880 this difference amounted to $0.57 (2*s.* 4*d.*), in 1894 to $0.34 (1*s.* 5*d.*) and in 1909 to $0.42 (1*s.* 9*d.*).

When the labourer was hired only for the season the monthly wages were in 1866 $2.58 (10*s.* 7½*d.*) and in 1909 $2.79 (11*s.* 6*d.*) higher than when he was hired for the whole year.

In the second and smaller part of the report, the writer gives a review of the results of three enquiries (1902-1906-1909) on the conditions of wages for female domestic labour in the country.

In 1909 26.4 per cent. of the female servants were hired for the whole year. The highest percentage is 40.6 in the north Atlantic States, then follow the south Atlantic States with 30.8, the northern central States with 23.1, the southern central States with 22.7 and lastly the western States with 22.3 per cent.

The average monthly wages of these servants amounted in 1902 to $8.69 (£1 15*s.* 9*d.*), in 1906 to $10.80 (£2 4*s.* 5*d.*) and to $10.39 (£2 2*s.* 9*d.*) in 1909. In 1909 they were highest in the western States $18.74 (£3 17*s.*); then followed the north Atlantic groups of States with $11.59 (£2 7*s.* 8*d.*), the northern central States with $11.38 (£2 6*s.* 10*d.*), the southern middle States with $8.22 (£1 13*s.* 10*d.*) and lastly the south Atlantic States with $6.39 (£1 6*s.* 3½*d.*).

When the servants were hired only for the season the monthly wages were, on average, $1 to $1.50 (4*s.* 1½*d.* to 6*s.* 2*d.*) higher; in the western States in this case they reached in 1909 $21.55 (£4 8*s.* 8*d.*), in the south Atlantic States $8.25 (£1 13*s.* 11*d.*).

As daily wages for female farm hands $0.62, 0.76 and 0.77 (2*s.* 6½*d.*, 3*s.* 1½*d.* and 3*s.* 2*d.*) were paid in the above three years.

The returns showed that the neighbourhood of towns with upwards of 25 000 inhabitants did not have in every State the effect of increasing the rates of wages of female workers, and that this depends more on the special conditions of each State.

In conclusion the writer notes that also in the United States work in the household is often considered as a derogatory occupation, and he deplores the disappearance of the so-called home industries in the country.

173 - The First Year of Book-keeping at the Agricultural Institute of Rotholz in Tyrol.

GROFF, L.: Das erste Buchführungsjahr an der landwirtschaftlichen Landesanstalt Rotholz in Tirol. — *Wiener Landwirtschaftliche Zeitung*, 63rd Year, No. 3, pp. 25-26. Wien, January 6, 1913.

The writer proposes to show by the present results of book-keeping how erroneous is the widely spread view that the farm of an educational institution cannot in itself be a profitable undertaking.

The farm of the Institute is of a compact form and includes 242 acres of arable land, 168 acres wooded area, and 617 acres of alpine pasture. Of the arable land 178 acres are rented out, only 64 being farmed by the Institute. Of these 44½ are under lea and forage crops, 12 acres devoted to other crops and 7½ to the nursery and vegetable garden.

The accounts are divided into three groups: 1) field crop accounts, 2) live stock and alpine pasture accounts, 3) technical or accessory industrial branch.

The total expense for the meadows amounted in 1911 to £179 2*s.* 8*d.*, the gross returns to £361 16*s.* 11*d.*, which leaves a net profit of £182 14*s.* 3*d.*, or 16.5 per cent. on the capital. The fairly high yield of 63.7 cwt. of hay per acre from the bad wet meadows of the Institute is due to the dry summer.

The favourable weather allowed the hay to be harvested with a small amount of labour, so that the cost of production, 1*s.* 6*d.* per cwt., is much below the calculated market price of 2*s.* 7½*d.* per cwt. For clover hay the cost of production, owing to the greater amount of work it entails, is much higher: 2*s.* 1*d.* per cwt.

The further calculation of the profits on the field crops is given in the following table.

The cultivation of green maize yielded only 5 per cent. interest, while with vetches the cost of production was much higher than the value of the vetch hay. The field crop accounts show on the whole a net profit of 14.2 per cent. on the capital.

Crops and Area in acres		Expense	Gross returns	Net profit		
				Total	Per acre	Per cent. on capital
		£ s d	£ s d	£ s d	£ s d	
Potatoes	4.32 acre	99 10 9	138 8 4¾	38 17 7¾	8 19 9	21.0
Wheat	4.64 »	59 8 1½	76 5 4	16 17 2½	3 12 6	8.7
Mangolds	0.79 »	26 19 6¼	35 19 4¼	8 19 10	10 16 10	26.4

The alpine pasture yielded £84 16*s.* 10*d.* against an outlay of £66 16*s.* 3 ¾ *d.*, the net profit being thus £18 0*s.* 6¼*d.*, or 0.91 per cent. of the capital. In order to improve this result the writer demands that the sum paid for the grazing of stock belonging to outsiders be raised. At present it is only 1.3*d.* per head per day.

In the cattle shed there were in 1911, 45 cows, 1 bull, and 5 heifer and 5 bull calves. The net profits from the cattle amounted to £88 2*s.* 7¼*d*, or 7.4 per cent. on the capital. (Outlay £954 3*s.* 2¼*d.*, gross returns £1042 5*s.* 9½*d*). Pig rearing yielded as much as 9.05 per cent. on the capital. The total outlay for draught stock (2 horses, 2 oxen, 1 mule) represents, after deduction of the income derived from manure, increase of value and work done for hire, the value of the work done in the farm. This account therefore shows no net profit.

The dairy gave a net profit of £105 4*s.* 10*d.* or 22 per cent. on the capital. The production of butter and skimmed milk cheese proved more profitable than the direct sale of the milk. The percentage of net profit seems disproportionally high; the reason of this is to be sought in the low valuation of the capital. The total net return of the farm managed by the Institute is 7.24 per cent., and including the accessory industries (dairy, forest and nursery) 7.8 per cent. of the capital.

To these very favourable results in 1911 several factors contributed: the price given to the land: £19 16*s.* 9*d.* per acre, is very low in comparison to present prices. The weather conditions of 1911 were unusually favourable for the property, which has an excessively moist subsoil; and whenever possible expensive human labour was replaced by labour-saving machines. But even giving the land a higher value and allowing for less favourable weather, the interest on the capital engaged in the farm of the Institute will not sink below the normal rate of 4 per cent.

174 - A Cantonal Agricultural Book-keeping Office.

Eine kantonale landwirtschaftliche Buchführungsstelle. Mitteilung der landwirtschaftlichen Gesellschaft des Kantons St. Gallen. — *Schweizerische Landwirtschaftliche Zeitschrift*, Year XL, Part 50, pp. 1164-1165. Zürich, December 13, 1912.

The board of the agricultural society of the Canton of St. Gall resolved on December 2, to institute a cantonal book-keeping office in con-

176 - The Use of the « Gär-Reductase » Test in Conjunction with the Usual Milk Tests as a Basis for the Price of Milk in Cooperative Dairies.

KONRADI, EMIL : Die Gärreduktaseprobe in Verbindung mit der gewöhnlichen Milchprüfung als Grundlage für die Gutebezahlung der Milch in Genossenschaftsmolkereien. — *Molkerei-Zeitung Berlin*, Nos. 52 and 53, pp. 601-602 and 613-614. Berlin, December 21 and 28, 1912.

The "Gär-reductase" test, according to Orla Jensen, serves to show defects in milk. The Gär tests alone were first used in Switzerland for testing and pricing the milk in cheese factories. The reductase test, which was first employed by Barthel, depends upon the fact that living bacteria have the property of taking up certain colouring matters and excreting in their place colourless matabolism products, whereby the colouring matters introduced into the milk disappear. The rapidity of this process depends on the temperature and the number of bacteria present. If all the samples of milk receive the same amount of colouring matters and are kept at the same temperature, the rate of discoloration depends entirely on the number of the bacteria.

Jensen has combined the two methods. He took a sample of 40cc. from each milk can ; to this he added 1 cc. of a methyl-blue solution, made by dissolving one methyl-blue tablet, prepared expressly for this purpose, in 200 cc. of water. The milk samples into which the colouring matter had been introduced were placed in a water-bath, which was kept at the constant temperature of 38° C. The milk should be carefully watched for the first 20 minutes ; afterwards it need only be looked at every quarter of an hour.

The milk can be divided into four classes, according to its behaviour during the test.

I. Good milk : the colour is perceptible for 5½ hours or longer. In this case, there are usually half a million bacteria to the cubic centimetre of milk.

II. Average milk : the colour is visible for at least 2 hours ; before 5½ hours have elapsed, the discoloration takes place. Number of bacteria per cc. usually from ½ to 4 millions.

III. Bad milk : the colour is apparent for over 20 minutes ; before two hours, the colour disappears. Number of bacteria per cc. generally from 4 to 20 millions.

IV. Very bad milk : The colour is perceptible at most for 20 minutes. Bacteria per cc. usually over 20 millions.

As the bacterial flora in the milk samples is apparently unaffected by the colouring-matter absorbed, the various samples are kept at from 38°-40°C. until the next day (20-24 hours) ; at the end of this time the milk has usually curdled. The appearance of the curdled samples depends upon the bacteria which have gained the upper hand and which were present in the greatest number at the beginning of the experiment. Thus, the samples may be gelatinous, distended by gas, spongy or cheese-like ;

and in this way demonstrate the presence of harmful bacteria in the milk (1).

If the results of the " Gär-reductase " test (taking also into consideration the fat content, etc.) is taken as a basis for the price of milk, the question arises whether the normal price should be paid for good milk and a corresponding reduction made in the case of milk of inferior qualities, or whether there should be a fixed price for all milk, with an additional charge at the end of the year for especially good milk. The writer thinks the latter system the best. It offers more encouragement than does price reduction for the production of milk free from defects.

A periodic control of the milk sent to the dairies is therefore to be recommended. The writer mentions some Danish dairies in which such a control is effected (now partly with the assistance of the " Gär-reductase " test) twelve and twenty-six times respectively every year.

177 - Prices of Meat in the Argentine, New York and some European Cities.

MEAT INDUSTRY

1. — MICHELET, JUAN A. Precios de las carnes en la Argentina, y en las principales ciudades europeas. — *Revista de la Asociación rural del Uruguay*, Year XLI, Nos. 9 and 10, pp. 649-656 and 763-766. Montevideo, September and October 1912.

2. — Rapport de M. VINCEY à la Section de l'économie du bétail et de l'industrie laitière de la Société des Agriculteurs de France. — *Bulletin de la Société des Agriculteurs de France*, Year 15, pp. 13-16. Paris, Jan. 1, 1913 (2).

In the *Argentine* the price of meat, which was 2.1 *d* per lb. at the beginning of 1912 reached 3.4 *d* per lb. at the close of the same year. As a comparison the writer gives the prices of meat in other countries, mostly obtained from official publications. A typical case is provided by Great Britain, which consumes the best quality Argentine cattle at a lower price than the non-exportable offals fetch in the producing country.

The Argentine municipalities oblige butchers to sell meat by weight and to exhibit a list of prices ; but as a matter of fact the meat is sold by the joint and not by weight, and the consumer pays 30 to 40 per cent. more than the nominal price. The following is the municipal tariff at Buenos Ayres (in pence per lb.) :

Surloin	7.7	Chop	2.9
Chuck-steak	3.8	Brisket	2.4
Round	3.8	Shoulder	2.4
Bones	1.4		

Price of meat in New York. — In 1912 the prices of meat were the highest ever known in the United States. In September beef was at 30.3*d* the pound, and it was predicted that before the end of the year it would reach 21.7*d*. Cattle are sold at 15 to 17 *d* per lb. of live-weight. Reckoning bullocks at 59 per cent., the New York prices are lower than the Argentine ones. In Argentine the cold-storage firms pay 11 *d* to 12½ *d* per lb. live-weight.

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(1) The curd should be equally dense, and not stringy, flocculent or interrupted by gas bubbles. See RIEVEL, *Handbuch der Milchkunde*, p. 317. Hannover, 1910. (*Ed.*).

(2) See also : VINCEY et ROLLIN, *Le prix de la viande à Paris* .Paris, Dunot-Pinat, 1912. (*Ed.*).

Price of meat in the United Kingdon. — In 1911 the Argentine furnished 85.5 per cent. of the refrigerated meat imported. The amounts sent to London were too large, so that prices fell and sales were made with 50 per cent. loss. This state of affairs decided the Argentine cold-storage firms to establish, at the beginning of 1912, an agreement by which the exportation of chilled beef was limited to 37 000 quarters per week, distributed equally among the various exporting firms, instead of the 50 000 to 60 000 which were sent in the last few months of 1911. After the conclusion of this agreement, which the writer thinks essential to allow a margin of profit to the Argentine companies, the prices of refrigerated and frozen meat on the London market rose about the middle of 1912.

Live bullocks from U. S. A.,	per head (March 1912)	\$ 18 to \$ 25
„ „ „ Canada,	„ „ „ „	\$ 17 to \$ 23
Frozen beef from U. S. A.	„ „	5½d to 6½d. per lb.
Argentine beef (May 1912):		
Hind quarter (chilled)		3s. 4d. to 4s. 4d. per stone
Hind quarter (frozen)		2s. 9s. to 3s. 6d. „ „
Fore quarter (chilled)		2s. 4d. to 2s. 8d. „ „
Fore quarter (frozen)		2s. 4d. „ „
Frozen Argentine mutton (May 1912)		2s. 2d. to 2s. 7d. „ „
Preserved meat (March 1912):		
Corned beef, 1st quality	per case(*)	33s. to 33s. 6d
„ „ 2nd quality	„ „	27s. to 33s.
Boiled beef, 1st quality		21s. 6d. to 22s.
2nd quality		19s. 6d to 20s.
Corned mutton		33s. to 34s.
Boiled mutton, 1st quality		28s. to 28s. 6d.
„ „ 2nd quality		26s. to 27s.

(*) Containing 12 tins of 6 lbs. each.

Price of meat in France (1). — The following tables show the prices at some of the important markets in France:

Prices of meat on the market of La Villette, Paris (2)

Average price in	Bullocks		Cows		Bulls		Calves		Sheep		Pigs	
	Quality		Quality		Quality		Quality		Quality		Quality	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.
June 1912	7.8	6.5	7.8	6.5	6.9	6.5	8.8	7.2	10.0	9.1	9.3	8.9
Year 1911	8.5	7.7	8.5	7.7	7.3	6.9	10.4	9.1	11.3	10.5	9.4	9.1
„ 1910	7.6	7.3	7.6	6.9	6.3	6.1	8.6	7.7	9.5	8.7	7.4	7.2
„ 1909	7.1	6.8	7.1	6.7	6.0	5.9	8.9	8.3	10.1	9.7	6.3	6.1
„ 1908	7.0	6.4	6.8	6.1	5.7	5.4	8.8	8.2	10.0	9.4	7.5	7.3

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(1) See No. 180 below. (*Ed.*).

(2) The wholesale prices of meat at the "Halles Centrales" and those of live stock at the market at La Villette are published monthly in: *Ministère de l'Agriculture, Direction de l'Agriculture, Bulletin mensuel de l'Office de Renseignements agricoles*, Paris. (*Ed.*).

Mean retail prices in Paris, 1912.

Bullocks and Cows	Sheep	Calves
Chuck-steak . 1*s*. to 1*s*. 3*d*. per lb.	Breast 6*d*. to 7*d*. per lb.	Breast 10½*d*. to 1*s*. per lb.
Rib . . . 9*d*. to 1*s*. 1½*d*. ,,	Shoulder 9*d*. to 10½d. ,, ,,	Loin 11¼*d*. to 1*s*. 0¾*d*.
Loin . . . 1*s*. 1½*d*. to 1*s*. 6*d*.	Leg 11¼*d*. to 1*s*. 0½*d*.	
Round . . 1*s*. 4*d*. ,, ,,		
Brisket . 10½*d*. ,, ,,		

Prices of live stock at Bayonne

Butcher's bullocks	3½*d*. per lb. live-weight.
Draught oxen	£24 to £32 the pair.
Cows	£18 to £26 ,, ,,
Milk fed calves	5½*d*. per lb. live-weight.
Sheep	4½*d*. ,, ,, ,,
Pigs	6½*d* ,, ,, ,,

During the last ten years, the French exports of horses, cattle and pigs and fresh meat have been steadily gaining on the corresponding imports. The only exceptions were the years 1907 and 1901, during which the imports of live pigs and fresh meat were again larger. On the other hand, for salt and smoked meat the imports have always exceeded the exports. Since the end of last century the prices of meat in France have been going steadily up. At the end of spring in 1911 they were 25 per cent. above the means of the years 1901 to 1910. These very high prices of the first half of 1911 resulted in an annual diminution of the consumption of meat in Paris equal to one-twentieth of the total consumption in 1910.

The retail butchers and pork-butchers generally sell at about 1½ *d* or 1¾ *d* per lb. dearer than they buy, wholesale or semi-wholesale, at the municipal shambles at the "Halles Centrales" and in the provision markets. This raising of price from the wholesale or semi-wholesale means about 1¼ *d* for general expenses and ¼ *d* or ½ *d* for profit. Thus in the price paid by the Parisian consumer, the wholesale price accounts for 85 per cent. and the retailer's handling for 15 per cent., namely 12 per cent. general expenses and 3 per cent. profit. On the money returns of all sales, both meat and bye-products of the total of butchers and pork-butchers' beasts, the country provider gets approximately 76 per cent. For expenses and profits the remaining 24 per cent. are thus distributed among the intermediaries: 2 per cent. to the railway companies, 1 per cent. to the auctioneers, 5 per cent. to the city of Paris, 3 per cent. to the wholesale butchers and pork butchers, and 13 per cent. to the retailers ; this is reckoning all sorts and qualities, and an average distance from Paris.

Price of meat in Sweden.

Bullocks and cows	3*d*. to 4¾*d*. per lb.
Sheep for slaughter	4½*d*. to 5¼*d*. ,, ,,
Suet	3⅛*d*. ,, ,,

Price of meat in Belgium.

Year	1880	1890	1895	1900	1905	1910	1911
Bullocks and cows pence per lb.	6.9	6.7	6.75	6.7	7.25	7.8	8.7
Pigs „ „ „	7.8	6.25	4.4	4.8	6.1	7.1	7.4

Average prices in the first half of 1912.:

	Live cattle pence per lb.	Meat wholesale pence per lb.
Native bullocks	4.3 - 5.4	7.4 - 9.75
Bullocks from U. S. A.	3.9 - 4.8	6.5 - 8.2
Dutch bullocks	4.8 - 5.4	7.6 - 9.5
French bullocks	4.8 - 5.2	7.4 - 9.5
Calves	4.8 - 6.3	8.7 - 13.0
Pigs	4.8 - 6.1	7.4 - 9.5

The eating of horse-meat has developed greatly in Belgium: in the slaughter-houses at Brussels and Cureghem-Anderlecht the number of horses slaughtered has increased from 1847 to 3809 in the last five years. In 1908, 16 099 horses for slaughtering were imported into Belgium, valued by the customs at £3 11*s* per head. At present the horses for slaughter (mostly from Great Britain) fetch £6 to £12 for a weight of 660 to 880 lbs. The consumer pays 3 ½*d* to 5*d* per lb. for horse-meat as steaks, 3*d* to 5*d* for scrap.

Price of meat in Spain — The exportation of live beasts from the Argentine to Malaga and Barcelona has given good results. At Barcelona the bullocks sold at 6½*d* to 6 3/4 *d* per lb. of meat (weight of the quarters) and the sheep at 6½*d*. Small beasts are preferred; bullocks should not exceed 550 lbs. (weight of the quarters) or sheep 42 lbs. The bullocks consumed in Spain are mostly of good quality, especially the rather small native ones weighing 300 to 400 lbs. The larger imported bullocks, weighing 600 to 800 lbs., are fatter and less choice. Slaughtering calves under 130 lbs. in weight is prohibited.

Sale prices of meat in Spain.

	Bullocks	Calves	Sheep	Grass Lambs	Milk Lambs	Sheep	Pigs
Pence per lb.	6.4-7.5	8.75	6.9-7.6	6.5	8.75(*)	6.5	5.6-7.8

(*) Milk lambs are generally sold by head.

Retail prices of meat.

		per lb.		per lb.
Bullocks:			Milk kids and lanbs:	
1st quality:	under cut	1*s*. 6*d*.	1st quality	10½*d*.
1st quality	without bones	11¼*d*.	2nd quality with bones	8¾*d*.
„ „	with bones	7¾*d*.	Sheep:	
2nd quality	without bones	9½*d*.	1st quality	10½*d*.
„ „	with bones	7¼*d*.		
Calves:			Pigs:	
1st quality	without bones	1*s*. 6*d*.	Loin without bones	10¼*d*. to 1*s*. 1*d*.
2nd „	without bones	11¼*d*.	„ with bones	8½*d*. to 9½*d*.
3rd „	with bones	10¾*d*.		

Prices of green hides.

	Pence per lb.
Bullock hide	6.3
Calfskin	7.4
Sheepskin	0.7
Lambskin	7.6

Price of Argentine meat in Austria.

	Pence per lb.
Price of frozen meat in the Argentine	2.3
Shipping from Buenos-Ayres to London	0.36
Shipping from London to Trieste	0.23
Austrian customs duty	1.4
Carriage from Trieste to Vienna	0.14
Expenses of unloading, etc.	0.05
Cost of 1 lb. of frozen meat delivered in Vienna	4.5

Argentine meat, at the depot, with 10 per cent. waste:

Fore quarters, per cwt.	30s.
Hind quarters, ,, ,,	35s.

Price of meat in Italy.

Retail prices.

	Fore quarter with bones pence per lb.	Hind quarter with bones pence per lb.	Meat without bones pence per lb.
Bullocks or Cows:			
Rome	7.8-8.2	8.7-9.8	11.3-15.6
Genoa	7.8	7.8	12.1-13.0
Bologna	7.8	10.0	13.0
Florence	6.5-7.2	9.8	11.7-16.0
Venice	8.2	10.0	12.1
Calves:			
Rome	7.8-12.6	15.2-16.2	13.4-15.2
Genoa	10.8	10.8	17.3-21.7
Bologna	10.8	10.8	21.7
Florence	6.5-8.5	12.6-13.4	15.6

Cost of Argentine meat at Genoa.

	Pence per lb.	For shipments of over 1000 tons. pence per lb.
Meat on board at Buenos Ayres	2.39	2.17
Shipping to Genoa	0.87	0.35
Insurance	0.02	0.02
Customs duty at Genoa	0.61	0.61
Expenses of unloading, etc.	0.35	0.70
Total	4.24	3.85

Cost of Argentine meat at Rome.

	Pence per lb.
Cost at Genoa	4.24
Railway carriage from Genoa to Rome	0.26
Municipal dues	0.82
Slaughterhouse dues	0.07
Carting in Rome	0.04
Depot : say 30 days in cold store	0.43
Distribution to butchers' shops, other expenses	0.22
Loss, deterioration and interest on capital	0.22
Total . . .	6.30

Price of Argentine Cattle in Switzerland.

Cost of importing a bullock to Berne or Lausanne.

	£	s	d
Shipping from Buenos Ayres to Genoa	5	7	0
Feeding	2	0	0
Expenses of unloading		5	6
Carriage from Genoa to Lausanne or Berne	1	5	6
Customs duties	1	5	6
Various expenses		7	0
Total . . .	£10	10	6

The above figures refer to beasts which gave 715 lbs. of meat on slaughtering; this was sold at nearly 8½ *d* per lb. *i. e.* £25 2*s*; deducting the expenses, there remains £14 11*s* 6*d* for the price of the beast at Buenos Ayres.

178 - Importation of Cattle and Meat from the Argentine to Italy.

1. ZABALA, ROMULO. Importación de ganado y carnes argentinas al Reino de Italia. — *Republica Argentina, Boletin del Ministerio de Relaciones Exteriores y Culto*, Vol. XXXVI, No. 1, pp. 127-139. Buenos Aires, 1912.

2. ACEVEDO, EDUARDO. Exportación de ganado á Italia. — *Revista de la Asociación rural del Uruguay*, Year XLI, No. 9, pp. 691-696. Montevideo, September 1912.

1. — Italy holds the first place among European countries as an importer of Argentine cattle, and is second only to Belgium as an importer of sheep. The sale of Argentine beasts and meat is spreading all over Italy; but at present it is of most importance in Liguria, Piedmont and Lombardy. Tuscany is furnished from the port of Leghorn, to which the beasts are reshipped from Genoa; the writer considers that this reshipping might be avoided, and that Leghorn is a sufficiently important centre of importation to have a direct service. The cost of reshipping from Genoa to Leghorn is 7 *s* 6 *d* per head for cows and bullocks and 14 *s* for bulls, plus 5 per cent. for the captain of the ship.

Italian customs duties on live cattle.

Bullocks	30 *s*
Bulls	14 *s* 3 *d*
Cows	. .
Calves	6 *s* 3 *d*

Current prices for live Argentine cattle delivered in Leghorn.

	per cwt.
Steer calves	36 *s*
Bullocks of 30 months, of at least 6 cwt.	40 *s*
» from 5 months to one year	40 to 44 *s*
Cows and heifer calves	32 to 36 *s*

2. — In 1911 the imporation from the Argentine to the port of Genoa was 33 846 steers, 12 428 wethers and 4 750 tons of frozen meat. The mortality on board in the early part of the year was 6 to 10 per cent., but later it fell to 2 per cent owing to improvement in the conditions. The tariff varied between £ 4 and £ 5 12 *s* per head, and rose temporarily even higher than the latter figure. Insurance *f. a. p.* (against extraordinary losses) costs 1 per cent; *c. a. p.* insurance (for ordinary mortality) is not undertaken by Italian companies, but English ones undertake it at various prices (such as 6 per cent., with 2 per cent. returned if no claims are made). Insurance is reckoned on a basis of £ 13 17 *s* 6 *d* to £ 15 17 *s* 6 *d* per head. The average price for live beasts at Genoa is 34 *s* per cwt.; or after the customs duty is paid 38 *s*. In the meat-marts at Genoa the price of beef is about £ 4 per cwt. for Italian and French, and about £ 3 8 *s* for Argentine.

179 - The Dead Meat Trade.

ROULSTON, O. W. H. in *The Department of Agriculture and Technical Instruction for Ireland: Journal*, Vol. XIII, No. 1, pp. 27-36. Dublin, October 1912.

The value of the meat consumed in England between the years 1856 and 1862 was 2*s*. 6*d*. per inhabitant per year, while in the period 1905-1911 it rose to 21*s*. 7*d*. The value of the meat imported during these two periods rose from £3 584 000 to £48 042 000. While in 1897 the amount of living cattle imported, namely 4 000 000 cwts. exceeded by much the quantity of beef imported (3 500 000 cwts.), in 1911 the former sank to 1 300 000 cwts. and the latter rose to 8 000 000 cwts. A similar change took place with mutton.

These variations are due principally to two causes. The exportation of living animals is always liable to interruption by the outbreak of some disease leading to the prohibition of imports by other countries. Consequently, when the introduction of dead meat has once begun no one cares to go back to the exportation of living animals. The second reason is that the cost of transport of dead meat, both by rail and by ship, is considerably inferior to that of living animals. Besides which there is the advantage that with the dead meat trade other industries can be connected, such as converting some of the offal into useful food stuffs, leather tanning, the manufacture of soap, margarine, glue, horn combs, fertilizers, etc. All these reasons contribute to give the dead meat trade a broad and firm basis in the Smithfield market.

The buildings of this, the greatest meat market in the world, cover an area of about 10 acres, and include 344 butchers' shops with a staff of about 5000 persons. The amount of meat it dealt with in 1907 was 419 037 tons and in 1911, 435 316 tons. Of this mass of meat 77.2 per cent. came from the colonies and from abroad, of which 80 per cent. was imported in cold storage. Argentina provides the greatest quantity of beef, whilst New Zealand is the greatest purveyor of mutton, though Australia sends nearly as much. The United States and Denmark hold the first place as providers of bacon and hams, while Holland supplies the greatest quantity (80 per cent.) of fresh pork. In the United Kingdom itself for a long time past Scotland has forwarded the best qualities of beef and mutton. In particular, Aberdeen sends to Smithfield, in specially built railway cars, great quantities of meat, which command the highest prices.

In Holland the slaughter houses which kill pigs for exportation are situated as near as possible to the ports. The dead pigs are hung in rows on hooks in heavy cases and so carried by rail or ship. To every slaughter house veterinary surgeons are appointed by the Government to examine the meat as to its fitness. The offal is also sent to London. The writer has visited several large slaughterhouses in Holland which can deal with 2000 to 3000 pigs per day. He believes that Ireland also could sucessfully export fresh pork and mutton to England if the same measures as are current in Holland were adopted.

Though the trade in live stock between Ireland and England presents some advantages, such as the short distance for sea transit from port to port, and the formed connection between shipper and consumer, on the other hand greater advantages are offered by the dead meat trade, namely:

1. — Its special value at periods of disease outbreak, when the live stock trade is temporarily stopped.

2. — The avoidance of the loss of weight and deterioration in quality inevitable to the live system.

3. — The higher price commanded by really prime finished meat at Smithfield as proved by practical tests.

4. — The educational effect of a dead meat business on the Irish feeder, by showing him the profit to be realised by rearing and feeding cattle of the best quality and finishing them well.

5. — The probability that a trade that has been found profitable by Scotch feeders, who finish largely Irish stores, would be still more so to Irish farmers who produce the stores themselves.

6. — The establishment of subsidiary industries that would be rendered possible by the dead meat trade and would offer a considerable amount of employment.

The hides of cattle slaughtered in Ireland are either worked up in the Irish tanneries or exported chiefly to Liverpool, Manchester and Glasgow by English firms and brokers. A large proportion of the Irish hides are ultimately sent to America.

The fat is utilized to a certain extent in Ireland, but only for the manufacture of soap, while in Hamburg for instance the fat is refined and graded into three qualities for the production of margarine, lard and machine oil, and thus more profitably disposed of. The blood also in Hamburg is used for the preparation of sausages, molasses feeds, and manure, while in Ireland (with the exception of Dublin) it is thrown onto the manure heap.

In Ireland the heads, tails, tongues, hearts and livers are sold for soup and broth making, while in marketing centres they command much higher prices.

The average price paid for the offal of prime beef in the London market is 50*s*. In the year 1908 Ireland shipped to English and Scotch ports 862 634 head of cattle and 183 485 head were killed for home consumption. Taking the value of the offal at £2 10*s*. per head, the value of the raw material supplied to the United Kingdom equals over £200 000. In the same year 725 557 sheep were exported, and the offal value of these taken at 8*s*. each would represent an additional £290 000. There can be little doubt that, if these offals could be retained and worked up in Ireland, it would considerably enhance the present value of the cattle rearing industry to the country.

180 - The Sale of Cattle for the Butcher and the La Villette Market.

ROLLIN.: La vente du bétail de boucherie et le marché de la Villette. — *Bulletin des séances de la Société nationale d'Agriculture de France*, Vol. 72, No. 8, pp. 756-763. Paris, 1912.

The market of La Villette serves as a centre for the sale of cattle for the butcher and of meat for the supply of Paris, as it is situated at the junction of the railway-lines connecting the cattle-raising districts of Central and Western France with North and East France, where this industry is little practised. It is thus the meeting-ground for buyers and sellers from a large tract of country. On account of the size of the latter, the supply and demand are always equal. The market is open to all who wish to buy or sell cattle. Thus the small proprietors can arrange among themselves and send one of their number to La Villette to sell their cattle, if they do not care to entrust the matter to a middleman.

The writer gives details of the arrangements and selling-methods of the market and mentions the changes in prices. From 1899 to 1910, the price of meat rose, on account of the increased demand for this article of diet, the general increase in the production cost and the demand from abroad. In 1911, the price again rose, but without in any way benefiting the producer, for the return from cattle was very little owing to the protracted drought and a renewed outbreak of foot-and-mouth disease. The La Villette market thus affords a gage of the condition of cattle breeding.

It has been alleged, that the market by its cattle trade promoted the spread of the foot-and-mouth disease. The sending of cattle there was for a time forbidden, but this prohibition was soon cancelled, owing to its bad effect on the cattle trade and its inefficiency from a prophylactic standpoint.

It was then proposed to build slaughterhouses in the centres ot production and to have cattle markets attached where the animals were to be sold. These markets, however, proved disastrous for the senders, who were obliged to sell their animals for any price which was offered. Soon, however, the slaughterhouses became the property of large Joint Stock Companies, which by the formation of trusts, were enabled to enforce whatever prices they chose on the producer and the consumer. Thus, the price of meat did not go down. The middlemen of the La Villette market were only replaced by the agents of the Slaughterhouse Societies. Also the transport costs were not diminished, for the slaughterhouses were obliged to get their cattle from a distance of 30 to 60 miles or more, and further, the danger of spreading foot-and-mouth disease remained the same.

It was therefore best to improve the existing markets in the large towns and especially that of La Villette. In order to accomplish the latter purpose, it is necessary to rebuild and enlarge the railway-station and provide the slaughterhouses and market with their own sidings for loading cattle. The slaughterhouses must be better equipped with disinfecting appliances and have more cold-storage chambers.

If the conditions and means of transport were improved, and the police-regulations regarding foot-and-mouth disease extended, this important question, which is so much occupying the minds of agricultural organisers, would soon be solved.

L-MAKING

181 - The Making and Composition of Tunisian Wines.

MARCELLE, R. La Vinification et la Composition des Vins de Tunisie — *Bulletin trimestriel de la Direction Générale de l'Agriculture*, Year 16, No 63, pp 128-149 Tunis, Second Quarter. 1912

In the first part of his paper, the writer gives an account of the different processes of wine-making: he treats of the use of sulphurous acid, the products which are utilized, the determination of sulphurous acid, the changes which it undergoes, and its relation to alcoholic fermentation; and finally he suggests clarifying the must by centrifugal force. M. Marcelle has himself made some preliminary experiments in this direction, using small dairy separators. These experiments, although imperfect, seem of interest, for they allow of its being concluded that large industrial machines would furnish musts containing in suspension only pectic matters together with fine cellulose particles from the pulp.

In spite of the violent agitation which the liquids undergo on leaving the apparatus, the loss of the free sulphurous acid of the musts is relatively very small. On the other hand, the musts to be submitted to centrifugal action should only receive small quantities of sulphurous acid, since the economy of the process consists precisely in permitting these liquids to ferment immediately after purification through passing into the turbine.

The second part of the article in question treats of the composition of Tunisian wines, and shows that certain characteristics which they possess cause these natural products to fall under the suspicion of having been adulterated. Numerous tables of analyses and statistics of results obtained in the Laboratory of Agricultural Chemistry in Tunis give the facts on which the writer has based his opinion ; the latter is of the more value as he gives information and arguments, of which we reproduce the most important.

The Tunisian vineyard differs not only from the French, but also from those of the Departments of Algiers and Constantine. In the latter countries, the vine is usually planted on rich plains, where the rainfall exceeds 600 mm. (24 in.) and the vintage is often more than 880 gallons per acre. In Tunis, nine-tenths of the plantations are situated in districts with a rainfall of less than 450 mm. (18 in.), and the average yield of the vines in bearing is only 260 gallons. From these differences there arise variations in the composition of the wines, all the more so as the local climatic conditions produce differences in the physiological processes of ripening. The functions of the grapes are often hindered by the scorching of the organs which supply them with acids. Consequently, owing to the effect of the long dry summers, and especially when heat waves occur before the period of maturity, a must is produced which is poor in sugar, and the wine has a low alcohol content and at the same time is very deficient in acid.

These accidents are of annual occurrence in most of the vineyards. If it is true that certain stocks like Aramon, Monrastel, and Carignan are especially affected, yet cases of the same kind occur in the crop of a whole district. This for example was observed in the vintage of 1911.

Other important differences may be mentioned, showing that the rules of Blarez and Halphen cannot well be applied to Tunisian wines. The ripening of grapes, of which the synthetic activity appears to increase under the influence of intense insolation, differs in its progress from what has been observed in France. From the time of the grapes turning colour, the acid cannot accumulate in the fruit and when the ripening occurs steadily the alcohol content of the wines increases with their acidity. The composition even of the musts must also differ, for the addition of several grams of acid sometimes makes very little difference in the wine. In an experiment made at the Colonial School of Agriculture at Tunis the addition of 2.75 gr. of citric acid had increased the final amount of fixed acid in the wine from 0.3 to 0.4, and 3 gr. of tartaric acid to 0.7. This shows how arbitrary it would be to try and judge of the watering by subtracting the added acid from the acidity of the wines.

On the other hand, the statistics of the analytical results show that of 445 samples examined during the last five years, 27 per cent. of the Tunisian red wines and 40 per cent. of the white deviated by more than 0.3 ° from Halphen's rule and by 15.9 and 28.5 from that of Blarez. These samples came exclusively from well-known proprietors.

The wines from young vines give very low figures as regards alcohol content, acidity and the amount of dry substances present ; on the other hand, some grapes like Alicante, Ugni, and Chasselas are rich in alcohol, but often poor in extracted matter.

The presence of free tartaric acid has been detected in white and pink wines to which citric acid has not been added ; the red vintages of 1910 and 1911, however, show no trace of it.

The great majority of Tunisian wines, from different sources both as to vine and origin, give a dextro-rotary deviation ; the reverse is the case with French wines.

Normal boric acid occurs in Tunisian wine in the proportions of from 10 to 35 mgr. per litre ; and manganese was present in one sample in the exceptional amount of 20 mgr. ; this same sample contained 256 mgr. of iron. According to the writer, this might give a means of distinguishing normal from added manganese.

PLANT DISEASES

GENERAL INFORMATION.

182 - The National Quarantine Law of the United States of America and Regulations.

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

1. National Quarantine Law. An Act to regulate the importation of nursery stock, and other plants and plant products; to enable the Secretary of Agriculture to establish and maintin quarantine districts for plant diseases and insect pests; to permit and regulate the movement of fruits, plants, and vegetables therefrom, and for other purposes. — *The Monthly Bulletin of State Commission of Horticulture*, Vol. I, No. 10, pp. 791-795. Sacramento, California, September 1912.

2. *U. S. Department of Agriculture, Office of the Secretary, Federal Horticultural Board, Circular* No. 41 (Revised). Washington, December 20, 1912.

3. *U. S. Department of Agriculture, Office of the Secretary, Federal Horticultural Board, Notice of Quarantine.* No. 1, Washington, September 19, 1912.

4. *Notice of Quarantine* No. 2 (Domestic), September 28, 1912.

5. *Notice of Quarantine* No. 3 (Foreign), September 28, 1912.

6. *Notice of Quarantine* No. 4 (Domestic), November 13, 1912.

Sec. 1. — It shall be unlawful for any person to import or offer for entry into the United States any nursery stock unless and until a permit shall have been issued therefor by the Secretary of Agriculture, under such conditions and regulations as the said Secretary of Agriculture may prescribe, and unless such nursery stock shall be accompanied by a certificate of inspection, in manner and form as required by the Secretary of Agriculture, of the proper official of the country from which the importation is made, to the effect that the stock has been thoroughly inspected and is believed to be free from injurious plant diseases and insect pests; the Secretary of Agriculture shall issue the permit for any particular importation of nursery stock when the conditions and regulations as prescribed in this act shall have been complied with; nursery stock may be imported for experimental or scientific purposes by the Department of Agriculture upon such conditions and under such regulations as the said Secretary of Agriculture may prescribe; and further, that nursery stock imported from countries where no official system of inspection for such stock is maintained may be admitted upon such conditions and under such regulations as the Secretary of Agriculture may prescribe.

Sec. 2. — It shall be the duty of the Secretary of the Treasury promptly to notify the Secretary of Agriculture of the arrival of any nursery stock at port of entry; the person receiving such stock at port of entry shall, immediately upon entry and before such stock is delivered for shipment or removed from the port of entry, advise the Secretary of Agriculture or, at his direction, the proper State, territorial, or district official of the State or territory or the district to which such nursery is destined, or both, as the Secretary of Agriculture may elect, of the name and address of the consignee, the nature and quantity of the stock it is proposed to ship, and the country and locality where the same was grown. The same formalities are required for the transport from one State to another of the United States of any imported nursery stock, unless and until such imported stock has been inspected by the proper official.

Secs. 3 and 4. — The packages containing nursery stock shall be plainly and correctly marked to show the general nature and quantity of the contents, the country and locality where the same was grown, the name and address of the person shipping or forwarding the same, and the name and address of the consignee.

The same formalities are necessary for the transport from one State or territory or district of the United States into any other State or territory or district of any such imported nursery stock, unless it has been inspected by the proper official.

Sec. 5. — Whenever the Secretary of Agriculture shall determine that the unrestricted importation of any plants, fruits, vegetables, roots, bulbs, seeds, or other plant products not included by the term "nursery stock" as defined in section six of this Act may result in the entry into the United States or any of its territories or districts of injurious plant diseases or insect pests, he shall promulgate his determination, specifying the class of plants and plant products the importation of which shall be restricted and the country and locality where they are grown, and thereafter, and until such promulgation is withdrawn, such plants and plant products shall be subject to all the provisions of the foregoing sections of this Act; provided, that before the Secretary of Agriculture shall issue such promulgation, he shall, after due notice, give a public hearing, at which any interested party may appear and be heard, either in person or by attorney.

Sec. 6. — The term "nursery stock" shall include all field-grown florists' stock, trees, shrubs, vines, cuttings, grafts, scions, buds, fruit pits and other seeds of fruit and ornamental trees or shrubs, and other plants and plant products for propagation, except field, vegetable, and flower seeds, bedding plants, and other herbaceous plants, bulbs, and roots.

Sec. 7. — Whenever, in order to prevent the introduction into the United States of any tree, plant, or fruit disease or of any injurious insect, new to or not theretofore widely prevalent or distributed within and throughout the United States, the Secretary of Agriculture shall determine that it is necessary to forbid the importation into the United States of any class of nursery stock or of any other class of plants or plant products, and notwithstanding that such class of plants or plant products be accompanied by a certificate of inspection from the country of importation, before the Secretary of Agriculture shall issue such promulgation, he shall, after due notice to interested parties, give a public hearing, at which any interested party may appear and be heard, either in person or by attorney; provided further, that the quarantine provisions of this section, as applying to the white-pine blister rust (*Peridermium strobi*), potato wart(*Chrysophlyctis endobiotica* = *Synchytrium endobioticum*), and the Mediterranean fruit fly (*Ceratitis capitata*), shall become and be effective upon the passage of this Act.

Sec. 8. — The Secretary of Agriculture is authorized to quarantine any State, territory, or district of the United States, when he shall determine the fact that a dangerous plant disease or insect infestation, new to or not theretofore widely prevalent or distributed within and throughout the United States, exists in such State, territory or district; notice of such quarantine shall be given to interested parties and to the press. The quarantined State or territory or district shall not export plants or parts of plants unless they shall have conformed to the provisions taken in this connection by the Secretary of Agriculture and which refer to the inspection, disinfection, certification, and method and manner of delivery and shipment of the class of goods; provided, that before the Secretary of Agriculture shall promulgate that it is necessary to quarantine any State, territory, or district, he shall, after due notice, give a public hearing at which any interested party may appear and be heard, either in person or by attorney.

Sec. 9. — The Secretary of Agriculture shall make and promulgate such rules and regulations as may be necessary for carrying out the purposes of this Act.

Sections 10 and 11 establish the penalties incurred by offenders against this Act. They consist of fines not exceeding $500 (about £100) and of terms of imprisonment not exceeding one year.

Sec. 12 appoints a Federal Horticultural Board for the purpose of carrying out the provisions of this Act.

Sec. 13 appropriates the sum of $25 000 (about £5000) for the purposes and objects of this Act.

Sec. 14. — This Act shall become and be effective from and after the first day of October, nineteen hundred and twelve.

2* — The following Regulations concerning the importation of nursery stock were made by the Secretary of Agriculture of the United States on September 18th, 1912.

Definition. — See Section 6 of the said law. Furthermore, "All woody plants and parts thereof for propagation or planting are included within the term 'nursery stock.'"

Permits for Importation. — Persons wishing to import nursery stock must apply to the Secretary of Agriculture for a permit, stating the general nature and quantity of the nursery stock, the State, district or locality where grown, the name and address of the exporter, together with the name and address of the importer in the United States and the proposed port of entry. Applications for permits should be made in advance of the shipment of the nursery stock, but if, through no fault of the importer, stock shall arrive before the issue of a permit, the stock will be held in customs custody at the risk and expense of the importer for a period not exceeding ten days, pending the issue of a permit.

On approval by the Secretary of Agriculture of an application for the importation of nursery stock from countries which mantain nursery stock inspection, a permit will be issued. Permits will expire on the 30th day of June of the year following the date of issue.

Entry of Nursery Stock. — Entry of nursery stock will not be allowed unless accompained by a certificate issued by a duly authorised official of the country from which it is shipped, stating that it has been thoroughly inspected by him, and was found to be free from injurious plant diseases and insect pests. In the case of stock to be shipped between October 1st and May 31st this inspection must be made on or after October 1st, and for stock shipped during the growing season inspection must be made not more than 30 days prior to date of shipment. Until July 31st, 1913, however, the usual inspection certificate covering the previous growing season will be accepted. When the country from which any nursery stock is shipped maintains no official inspection, articles for which a permit has been issued will be admitted only through the ports of New York, San Francisco, Seattle, Jacksonville and New Orleans, after examination by inspectors of the Department of Agriculture at the port of arrival, if found to be free from plant diseases and insect pests.

Nursery stock, if found infected, may be treated or destroyed, as circumstances require.

Foreign Certificate of Inspection. — Certificates of inspection will be accepted if countersigned by duly authorised officials of foreign countries or their agents. On and after July 1st, 1912, certificates must give the date of inspection, name of the grower, the district or locality and country where grown, a statement that the stock has been inspected by a duly authorised official, and been found, or believed to be, free from dangerous insects and plant diseases, and must bear the name of the responsible inspection official for the country of origin.

Declaration. — On and after December 1st, 1912, all shipments of nursery stock to the United States from countries which maintain an official system of nursery stock inspection must be accompanied by a declaration of the shipper, produced before an American consular officer. The declaration must contain a statement by the shipper that he believes the nursery stock to contain no injurious plant diseases or insect pests, the district or locality and country where grown, the name of the grower, the port of origin, and destination of the consignment, the date of inspection of the stock, and the name of the inspector, and the number of the permit issued by the Secretary of Agriculture.

On and after December 1st, 1912, consular invoices covering shipments of nursery stock to the United States must bear the number of the permit issued by the Secretary of Agriculture, and have attached to them the shipper's declaration.

3* — Notice No. 1 prohibits the importation into the United States from Great Britain, France Belgium, Holland, Denmark, Norway, Sweden, Russia, Germany, Austria, Switzerland and Italy, until further notice, of the following species and their horticultural varieties, *viz.*, white pine (*Pinus strobus* L.), western white pine (*Pinus monticola* Dougl.), sugar pine (*Pinus lambertiana* Dougl.), and stone or cembrian pine (*Pinus cembra* L.). The object of this prohibition is to prevent the introduction into the United States of the tree disease known as "white pine blister rust" (*Peridermium Strobi* Kleb.).

4* — Notice No. 2 prohibits the movement from the Territory of Hawaii into any other State of the United States of America of Alligator pears, Carambolas, Chinese inkberry, Chinese orange, Chinese plums, Coffee berries, Damson plums, Eugenias, Figs, Grapes, Grapefruit, Green peppers, Guavas, Kamani seeds, Kumquats, Limes, Loquats, Mangos, Mock orange, Mountain apple, Natal or Kaffir plum, Oranges, Papaya, Peaches, Persimons, Prickley pears, Rose apple, Star apple, String beans, and Tomatoes. The object of this prohibition is to prevent the introduction into other States of the Mediterranean Fruit Fly (*Ceratitis capitata*), which is new to and not widely prevalent in the United States.

5* — Notice No. 3 prohibits the importation into the United States, until further notice, of the common or Irish potato (*Solanum tuberosum*) from Newfoundland, the islands of St. Pierre and Miquelon, Great Britain and Ireland, Germany and Austria-Hungary, where the disease known as potato wart, potato canker, black scab, etc. (*Chrysophlyctis endobiotica* Schilb., = *Synchytrium endobioticum* (Schilb.) Perc.) is declared to exist.

6* — Notice No. 4 quarantines the States of Maine, New Hampshire, Massachusetts and Rhode Island for Gipsy Moth (*Porthetria dispar*) and the States of Maine, Vermont, New Hampshire, Massachusetts, Connecticut and Rhode Island for Brown-Tail Moth (*Euproctis chrysorrhoea*).

The interstate movement of 1) coniferous trees, such as spruce fir, hemlock, pine, juniper (cedar) and arbor-vitæ (white cedar) and parts thereof, and decorative plants, such as holly and laurel, and 2) forest plant products, including logs, tan bark, posts, poles, railroad ties, cordwood and lumber, and field-grown florist's stock, trees, shrubs, vines, cuttings and other plants and plant products for planting and propagation, excepting buds, fruit pits, seeds of fruit and ornamental trees and shrubs, field, vegetable and flower seeds, bedding plants and other herbaceous plants and roots, from the quarantined areas is prohibited until plants and plant products have been inspected by the U. S. Department of Agriculture and pronounced free from the said insect pests.

183 - The Congress of the "Defensa Agricola" at Montevideo (Uruguay) in April 1913.

Communication from the Director of the "Defensa Agricola" of Montevideo to the International Institute of Agriculture.

Owing to the initiative of the "Ministerio de Industrias" the Congress of the "Defensa Agricola" will be held at Montevideo in April 1913. Argentina, Paraguay, Brazil and Chile have been invited to send delegates.

The following are the subjects proposed for discussion:

a) The control of locusts.

1. Given the present knowledge respecting the permanent and subpermanent zones where locusts occur, is collective international action possible in these districts?

2. The contribution of each State for the purpose of ascertaining whether there exist in their respective territories centres of distribution of locusts.

3. The form which co-operative international action against such centres could take, should such action appear desirable.

4. The proportion and the manner in which each State could participate in such action.

5. Is it best to adopt an official scheme of a permanent character, or to treat each case as it occurs and in the manner which seems most suitable?

6. Measures for ascertaining the existence of other species of migratory locusts, besides *Schistocerca paranensis*, against which it is neceesary to generalize the international measures of control. The information already in the possession of the Congress and any further data which are communicated respecting the existence of any at present undetermined species in the districts of South, North and West Brazil, in the States of Rio Janeiro, Paraná, Matto-Grosso, Parayba and Rio Grande di Norte. The manner of completing the investigations on this point.

7. The methods of controlling locusts practised in different countries and especially in those represented at the Congress. Methods of destruction: mechanical, physical (fire) and toxic. Biological agents. The utility of communicating generally the methods and systems of destruction in the case of auxiliary, or collective intervention, or of co-operative work for the destruction of the pests, especially in neighbouring countries.

b) Auxiliary telegraphic assistance.

8. The institution of an international telegraphic service, using the same code, for daily information respecting the condition and movements of the locusts.

9. The advisability of extending this service, and using it also for other purposes, such as for giving information concerning other agricultural pests.

10. Places which might serve as centres of information and where

bureaus entrusted with the regular transmission of news could be established.

11. The installation of a central service deputed to receive all data and to compile a demonstration table showing the various phases of the invasion, with indications as to the frequency of the flight of the insects, their numbers, the distance they fly, their retrogression, etc.

12. Could meteorological observations for each country be included in this service?

c) The control of other agricultural pests.

13. The advisability of devising a scheme of control for all the other pests which attack the crops. The measures adopted in each country and the results obtained.

14. The adoption of a uniform system in the service of the inspection of imported vegetable products, with the view of making more stringent the conditions of obtaining certificates of origin.

15. The advisibility of maintaining constant intercourse between the governments of the adhering countries and the methods of attaining this end.

16. The adoption of preventive measures against the invasion of new pests.

17. The organization of a service of information which will assist in preventing the introduction of new diseases by means of isolating infected and suspected areas.

18. The measures of assuring, to the persons charged with the export service, the efficiency necessary for exporting goods in a satisfactory condition.

d) Protocol of the Convention.

19. The advisibility of leaving the protocol of the convention open, in order that other South American countries may join.

20. The manner and date at which the approved measures will come into force, their duration and the method of proroguing them.

The delegates of each country can lay other schemes before the Congress.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

184 - The Effects of Road-Tarring on Trees at Leghorn (1).

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

BARSALI, E.: Sull'effetto dell'incatramatura delle vie a Livorno. — *Rivista di Patologia Vegetale*, Year 5, Nos. 21-22, pp. 321-323. Pavia, 1912.

When the new railway-station was built at Leghorn a central road was made leading to the town, parallel with which were side roads shaded by old elms, holm-oaks and planes.

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(1) See No. 967, *B.* June 1912. (*Ed.*).

A portion of the lateral roads was tarred, as was also a part of the main road, where the traffic was continuous. At first, nothing abnormal was noticed, but at the beginning of 1912, the old elms did not bud as usual and the leaves of the holm-oaks and other trees were partially withered. As the season advanced, the withering increased, till in July and August the elms had turned quite brown, and the holm-oaks were so in part, their leaves looking as though they had been burnt, while the planes, which were already injured by *Lithocolletis*, showed also signs of being attacked by this new disease.

The macroscopic and microscopic observations made by the writer on material sent to him, or later collected by himself, agreed with the preceding investigations.

BACTERIAL AND FUNGOID DISEASES.

BACTERIA

185 - The Structure and Development of "Crown Gall": A Plant Cancer (1).

SMITH, ERWIN, F; BROWN, NELLIE, A., and MCCULLOCH, LUCIA: *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 255, 60 pp., 2 figs., CIX plates. Washington, 1912.

The parasite of crown gall (*Bacterium tumefaciens*) has been isolated by the writers from 24 species belonging to 14 families of phanerogams. Some species have resisted infection. The parasite has been grown in pure culture on a variety of media and its morphology and cultural peculiarities determined. It has also been stained within the tissues of the tumor and its form and locus therein determined. The morphology and biological peculiarities of the tumor growth have been studied. The tissues of the gall multiply excessively and in opposition to the best interests of the plant. The galled tissue, which is often of a soft, fleshy nature, is much subject to decay. It is not usually corked over, and this absence of a protective surface allows the ready etrance of water and of other parasites. The tumor originates in meristem, usually in the cambium region. It may perish within a few months or continue to grow (parts of it) for years. The tumor consists, or may consist, not only of parenchyma but also of vessels and fibers, *i. e.* ,it is provided with a stroma which develops gradually as the tumor grows. A proliferating tumor usually contains not only meristem but pitted vessels and sieve tubes; it may also contain wood fibers, but does not always. The tumor sends out roots (tumor strands) into the normal tissues. These may extend for some distance from the tumor — how far is not known. These strands consist of meristem capable of originating medullary rays, tracheids, and sieve tubes. In the daisy the strand passes through the protoxylem region of the stem.

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(1) See No. 2967, *B.* Aug.-Sept.-Oct. 1911. (*Ed.*).

It is rich in chloroplasts. It usually takes a deeper stain than the surrounding tissues, from which it is sharply delimited. A considerable part of it consists of unripe, actively vegetating cells. In the substance of these deep-lying strands secondary tumors develop. These gradually rupture their way to the surface.

The secondary tumors tend to take on the structure of the primary tumor, *e. g.*, if the latter is in the stem and the former in a leaf, the secondary tumor shows a stem structure.

The stimulus to tumor development comes from the presence of the parasite within certain of the cells. Apparently it is not in all. The organism has not been observed with certainty outside of the cells, either in the vessels or the intercellular spaces, nor is it abundant in the cells. Usually copious inoculations have to be made to ensure cultures.

Under the microscope it can not be made out in unstained sections with any certainty, and most bacterial stains also fail to differentiate it in the tissues. It is best observed in tissues impregnated with chloride of gold.

By repeated inoculations through a series of years plants were obtained which appeared to be more resistant to the disease than check plants, but after subsequent inoculations on descendants of these plants numerous well-developed primary and secondary tumors appeared, so that the resistance must be regarded either (a) as of a fugitive nature, or (b) as of a low grade easily overcome by a more virulent strain of the parasite. That the cultures used for these subsequent inoculations came from a more virulent strain may be assumed both because they were plated from a tumor which appeared on one of the most resistant plants and because the cultures tried on a great number of plants produced primary tumors very quickly and showed an unusually strong tendency to develop secondary tumors.

The relation between the host and the parasite may be regarded as a symbiosis in which the parasite has the advantage.

The bacterium is a soil organism and planters should aim to keep their lands free from it by refusing to plant infected stock.

Nurserymen should plant on uninfected land and carefully avoid heeling good stock into soil which has previousy received infected plants. Nurserymen have been largely responsible for the dissemination of this disease.

The organism is a wound parasite. Its entrance is favored by careless grafting (Hedgcock) and by the presence of borers, nematodes, etc.

These galls occur on the roots of Legumes and have been mistaken for the nitrogen root nodules.

The development of this disease is regarded as closely paralleling what takes place in cancer of men and animals.

There are no true metastases in crown gall, but this does not militate against the comparison, for whether a cancer shall be propagated by floating islands of tissue, or only by tumor-strands, appears to be a secondary matter depending on the character of the host tissues rather than on the nature of the disease. The essential element is the internal stimulus to cell division.

MEANS OF
PREVENTION
AND CONTROL

186 - The Effect of Bordeaux Mixture on the Spores of *Spicaria farinosa* var. *verticilloides*, a Parasite of the Larvae of Vine Tineids.

FRON. Note sur l'influence des bouillies cupriques sur les spores des champignons du groupe des Isariées. — *Bulletin des Séances de la Société nationale d'Agriculture de France*, Vol. LXXII, No. 8, pp. 742-746. Paris, 1912.

It has been suggested that cupric mixtures, used as a remedy for the different diseases of the vine, hinder the propagation of the spores of the fungi parasitical on the insects which attack this plant.

The writer therefore undertook investigations as to whether the spores of *Spicaria farinosa* var. *verticilloides*, which seems to attack the larvæ of the Tineids *Conchylis ambiguella* ad *Polychrosis botrana* very virulently, are able to develop in contact with Bordeaux mixture, or after a longer or shorter immersion in it.

The results of numerous experiments showed that the fungus spores resisted the prolonged action of Bordeaux mixture; they were not killed by a fifteen hours' immersion in a "5 per cent." mixture, and they germinated normally on the substratum in spite of the mixture being sprayed on the surface of the nutritive medium. These facts correspond to those already observed in the case of other fungi.

It yet remains to be seen whether the infective power of the fungus grown under these conditions is modified as regards its host.

BACTERIAL
AND FUNGOID
DISEASES
OF VARIOUS
CROPS

187 - "Iliau": a Disease of Sugar Cane in Hawaii.

LYON, H. L. Iliau, an Endemic Cane Disease. — *Report of Work of the Experiment Station of the Hawaiian Sugar Planters' Association, Pathological and Physiological Series, Bulletin* No. 11, 32 pp., 10 figs, 1 plate. Honolulu, Hawaii, 1912.

The name "iliau" is a native term for a cane disease peculiar to Hawaii. The most conspicuous symptom is a binding of the leaf bases into a tight unyielding jacket about the stem, which prevents the latter making any further growth.

The disease is produced by a fungus whose perfect form is called by the writer *Gnomonia iliau* n. sp.; the imperfect form, previously discovered, being known as *Melanconium iliau*. The *Gnomonia* type of fruiting body is of infrequent occurrence. The ascus spores are discharged into the air and disseminated by the wind, while the *Melanconium* spores are formed in the interior of the diseased shoots and are largely responsible for the local spread of the infection; they are released, however, with the disintegration of the shoot. This takes place in a comparatively short time, if the affected shoot becomes soaked with water. The *Melanconium* spores do not germinate readily in water, and consequently are well adapted to water dissemination. They retain their vitality for long periods if protected from the sun, but are effectually destroyed if exposed for a short time to its direct rays.

Iliau is a disease of young canes. The fungus gains entrance to a shoot by entering the leaf bases, which join the stem below the surface of the soil; once inside the tissues, it causes the above-mentioned change in the latter. Other things being equal, iliau causes a greater mortality among plant canes than it does among rattoons. Cane stools or shoots which have been weakened by any cause are rendered more susceptible to the disease, which flourishes only during cool, damp weather. Demerara seedlings are the most resistant canes now being grown on a large scale, and consequently are good varieties to plant in fields where the disease is apt to flourish.

The most effective precautions that can be taken to minimize the danger of an iliau epidemic are thorough working of the soil and early plantings; these measures should be practised in addition to the ordinary means usually taken to ensure a good stand of healthy cane.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

188 - Fourth International Congress of Rice Growers at Vercelli, Italy (1912): the Control of Weeds in the Rice-Field.

NOVELLI, N. Il IV° Congresso risicolo internazionale. — *Il Giornale di Risicoltura*, Year III, No. 23, pp 364-365. Vercelli, December 15, 1912.

Amongst the orders of the day passed at the Fourth International Congress of Rice Growers at Vercelli in 1912, were the following:

Subject III. — *The Control of Weeds in Rice-fields*, Part I. — *The Weeds which infest the Italian Rice-fields.* Report by Prof. G. Jacometti.

"The Congress considers, that it is necessary:

"To continue the researches of Prof. Jacometti relating to breaking the life-cycle of the weeds which infest rice-fields, and that such researches should be carried on in all the rice-growing districts of Italy.

"To continue to weed carefully and regularly, not only at the usual season, but during the whole vegetative period of the rice.

"To clean carefully all imported seed, both of rice and of other crops, in the rice-growing districts.

"To invite the Government and the Agricultural Institutions to encourage rice-fields being kept clear by means of propaganda, competitions, prizes, etc.".

Part 2. — *The Best Systems for the Control of Weeds in Rice-Fields.* Report by Profs. V. Alpe and E. Ferrari. "The control of the weeds which invade rice-fields should be practised:

"1) *Outside the rice-field*: by preventing the seeding of weeds growing in the meadows, among maize, or on the banks dividing the fields, and which have escaped the scythe and the weeder, — not using the hulls as litter for animals, — using only such stable manure for rice-fields, as has undergone prolonged fermentation.

"2) *In the rice-field*: by only sowing seed which has been freed from weed seeds; by sowing and growing the rice for a short time, where possible, in dry soil; by regulating the water supply in such a manner as to hinder the development of the weeds without harming the cereal; and by turning the heaps of weeds, which have been collected during the cleaning, at the right time to prevent their sprouting again."

"The Congress passed a vote that the above-mentioned practices should be made the subject of wide-spread propaganda on the part of the Agricultural Institutions of the rice-growing zones."

189 - The Blackberry-Bud Moth: a Promising Agent for Control.

COCKAYNE, A. H. in *The Journal of the New Zealand Department of Agriculture*, Vol. V, No. 4, pp. 372-374. Wellington, October 15, 1912.

The Blackberry (*Rubus fruticosus* L.) was introduced into New Zealand as a cultivated plant; it then spread from place to place to such an extent that it has now become a very serious weed. Where cropping and temporary pastures form the basis of all farming operations the blackberry is not a dangerous problem. But where the bush has been converted into permanent pastures the blackberry is decidedly pernicious, and from the cleared country it has extended to the areas of standing timber, but here it is in general restricted to the outskirts.

The blackberry is spread by seed which is conveyed by animals, chiefly birds. The individual plants by means of their arching branches which bend down to the ground and then root, soon form extensive impenetrable thickets.

The main methods of control that have hitherto been employed have been cutting and burning, followed, in the case of pastures, by keeping the young fresh growth mowed down. In country which is very rough and where stumps and logs are numerous, the use of goats has been followed by excellent results. But these methods are necessarily expensive for large areas.

Up till quite recently the blackberry was singularly free from the attacks of any natural enemy that might be of value in its control. For a number of years past several parasitic fungi, notably orange-rust (*Caeoma nitens*), have been noted as occurring sporadically, but in no cases have their effects justified the opinion that any of them would prove efficacious. During the past two years, however, a hitherto rare native moth, *Carposina adreptella*, belonging to the Tortrix group, has suddenly multiplied enormously, attacking the young shoots of the blackberry, and destroying them to such an extent that hopes are entertained that it may prove an exceedingly valuable agent in controlling the spread of blackberry.

The eggs of the moth are laid in the leaf bases of the young shoots or in the bud itself. The larvæ hatch very soon, penetrate the soft tissue and bore through the pith for a distance of perhaps 2 inches. This is followed by the complete death of the terminal shoot and consequently the spreading by means of pendent branches is eliminated. The plants attacked remain small in size and isolated, besides which they appear to lose their power of producing flowers and fruit to the same extent as the unaffected ones. Perhaps the insect attacks the flower buds also, but this is a point that has not yet been investigated.

INSECT PESTS.

190 - Papers on Coccidae, or Scale Insects. The Genus *Fiorinia* in the United States.

GENERALITIES

SASSCER, E. R. in *U. S Department of Agriculture, Bureau of Entomology, Technical Series*, No. 16, Part V, pp. 75-82, plates X-XIII. Washington, December 6, 1912.

The genus *Fiorinia* Targioni, at the present time consists of some 30 described species and 4 varieties, and of this number there are only two species (*F. theae* Green and *F. fioriniae* Targioni) and one variety (*F. fioriniae* var. *japonica* Kuwana), at present known in the United States.

The writer first gives a description of the genus and then describes the three species of *Fiorinia* mentioned above, discussing their synonymy; geographical distribution, food plants and natural enemies.

The tea scale (*F. theae*) is recorded on camellias in Alabama, in the District of Columbia, Florida, Georgia, Louisiana, North Carolina and South Carolina. It has been collected also in Ceylon, the Philippine Islands and in various localities in India.

In the United States, this scale has only been found on camellias and tea, but in India it has been recorded also on olive (*Olea glandulifera*) and citrus; in the Philippines it occurs on a species of *Caryola*, and in the Royal Botanic Gardens at Peradeniya, Ceylon, on *Ostodes*.

Although *F. theae* seems to show a preference for tea at Summerville, South Carolina, it appears to be quite a serious pest on the camellias in several of the more Southern States, and is not infrequently found associated with *Lepidosaphes lasianthi* Green.

This scale is controlled by *Chilocorus bivulnerus* Muls., *Microweisea misella* Lec. and *Cybocephalus nigritulus* Lec. On the tea at Darjeeling these coccids are frequently covered by a parasitic fungus, which is doubtless in a measure effective in holding this pest in check.

Fiorinia fioriniae has a wide range of distribution and is known to occur in the following countries: Algeria, Australia, Barbados, Brazil, Ceylon, China, Egypt, Europe (Belgium and Spain), Jamaica, Japan, Madeira (?), Mauritius, Mexico, New South Wales, Peru, United States (Alabama, California, Colorado, District of Columbia, Louisiana, Maryland and Massachusetts), Hawaiian Islands, West Africa and Zanzibar.

The most important food plants of this scale are: *Anthurium acaule, Apollonias canariensis, Aralia, Areca aurea*, bamboo, bay, *Camellia, Celtis mauritiana, Chamaerops humilis*, coconut palm, *Cupressus, Cycas circinnalis, C. revoluta, Dracaena indivisa*, ferns, *Ficus elastica, Ficus* sp., *Garcinia* sp., *Hedera Helix*, Japanese Quince, *Kentia Belmoreana*, *K. Forsteriana*, *Larix* sp., *Leptospermum*, *Licuala*, *Livistona*, *Persea gratissima*, *Phoenix canariensis*, *Phoenix* sp., *Phormium tenax*, *Phytelephas macrocarpa*, *Podocarpus*, *Strelitzia Reginiae*, tea (*Thea japonica*).

Amongst the natural enemies of *F. fiorinae* are recorded: *a*) *Aspidiotiphagus citrinus* Craw., found enclosed in the body of an adult specimen of this scale in Washington, D. C., and on *Chamaerops humilis*; the same chalcid has also been reared from material on *Persea gratissima*, from Honolulu, Hawaii; *b*) another species of *Aspidiotiphagus* was reared from this scale on an undetermined plant collected at Hongkong; *c*) *Prospaltella aurantii* How., collected from this coccid on *Ficus* sp., at Swatow, Canton, China; *d*) *Sphaerostilbe coccophila*, the "red-headed fungus," observed in Mauritius on infested Camellias.

F. fioriniae var. *japonica*, although a native of Japan, has been introduced into the United States on numerous occasions on infested evergreens. In September of 1908 it was collected on *Tsuga* sp. at Queens, Long Island, and subsequently on Japanese hemlock at New York. In June 1909, it was observed on the fruit and leaves of *Podocarpus elata* received by the Bureau of Plant Industry from the Botanical Gardens of New South Wales. It has also occurred on *Podocarpus chinensis* and *Pinus* sp. in California; on *Podocarpus Nageia* and *Abies Veitchii* in the Philippines; and on *Pinus pentaphylla*, *P. Thunbergii* and *Tsuga Sieboldii* in Japan.

MEANS OF PREVENTION AND CONTROL

191 - Parasites of Apple Weevil observed in the Valle-di-Non (Trent, Austria).

CATONI, GIULIO.: Parassiti dell'*Anthonomus pomorum* (L.) osservati in Valle di Non (Trentino). — *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura in Portici*, Vol. VI, pp. 148-150, figs. I-II. Portici, 1912.

Of 3000 apple blooms gathered in April 1911 in the Valle di Non (Trent, Austria), and each containing a larva of the weevil (*Anthonomus pomorum*), in 846 or 28.2 per cent. the weevil larva was attacked by a parasite. Each of the diseased larvæ was placed in a glass tube, or in a little bag of very fine gauze. The flowers containing healthy larvæ were covered with a bell-jar. At the time that the adult weevils appeared beneath the bell-jar, it was observed that from the 846 parasitized larvæ four Hymenoptera emerged, in the following numbers: 647 *Pimpla pomorum* Ratzb., 63 *Meteorus ictericus* (Nees), 29 *Habrocytus fasciatus* Thoms and 6 *Apanteles impurus*, with a noticeable preponderance of females; 63 larvæ shrivelled up, and the remaining 38 were destroyed by a fungus determined as *Verticillium puparum*.

192 - Experiments in France in Acclimatizing some Species of *Glandina* which destroy other Gasteropods (1).

1. VILMORIN (de) PHILIPPE. Observations sur les Glandines à Verrières-le-Buisson. — *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 155, No. 23, pp. 1289-1294 + 1 fig. Paris, December 2, 1912.

2. BOYER, JACQUES. Les Glandines, Mollusques carnassiers du Mexique. — *La Nature*, Year 41, No. 2064, pp. 20-21 + 3 figs. Paris, December 14, 1912.

3. LAVERGNE, GASTON. Les Glandines ennemies des Limaces et des Escargots. — *Revue de Viticulture*, Year 19, Vol. XXXVIII, No. 993, pp. 754-758 3 figs. Paris, December 26, 1912.

Prof. Bouvier has received from Mexico, and has distributed to several members of the Société Nationale d'Agriculture de France, specimens of carnivorous snails of the genus *Glandina*, which he proposes to acclimatize in France for the purpose of controlling the other gasteropods which infest garden plants.

Of the 134 species of *Glandina* so far described, 53 are natives of the Antilles, and principally of Cuba, Jamaica, Haïti and Porto Rico; 48 of Mexico; and 8 of Guatemela; most of the rest come from other countries of South America, though a few species are indigenous to the countries bordering the Mediterranean. The European species do not possess, like their Americam relatives, powerful labial palps, enabling them to adopt a carnivorous diet.

The observations of M. Philippe de Vilmorin were made on 25 specimens of *Glandina olivacea* Schum. (*G. guttata* Crosse and Fischer) which were kept in the open at Verrières-le-Buisson, near Paris, from June to November 1912. It appears that *G. olivacea* devours snails with avidity, but does not seem to eat slugs, at any rate those of the genus *Arion*; it does not touch plants. It pairs and lays eggs in the Paris zone. It remains to be seen whether these eggs hatch out and whether the adults are able to stand the winter temperature. At —4°C. some died, while others went into a torpid condition.

M. Lavergne gives a description of the species of *Glandina*, with their geographical distribution and a list of 51 Mexican species; he mentions the previous acclimatization experiments in France and the recent experiments of Prof. Bouvier and Prof. Berthier, and refers to various observations made in France and Mexico on the habits of *Glandina*.

193 - The Caterpillar Pest of the Mokameh "Tal" Lands (2).

WOODHOUSE, E. J. and FLETCHER, T. BAINBRIGGE in *The Agricultural Journal of India*, Vol. VII, Part IV, pp. 343-354 + 2 maps and 1 fig. Calcutta-London, 1912.

For the last fifteen years or so the winter crops on about ten thousand acres of «Tal» land near Mokameh, on the southern bank of the Ganges near Patna, have been destroyed annually by *Agrotis ypsilon* caterpillars. These lands are flooded during the rains (June to September) to a depth of 5 to 15 ft., and are ploughed and sown as soon as the water recedes. The moths are apparently attracted to the wet mud, and lay their eggs there; the larvae attack the crops as soon as these spring up, rapidly increasing in numbers until the whole crop is totally destroyed. The crops chiefly sown are «masur» (lentil) and «khesari» (*Lathyrus sativus*), with some peas on the higher lands. This damage was reported in 1909, but the caterpillars had then already increased to such an extent that no remedial measures were of avail. In 1910 trials were made of handpicking, which was considered efficient if properly organised. In this year practically a normal amount of damage was done In 1911 systematic handpicking of the caterpillars was adopted as soon as they appeared, and over sixty thousand early broods were thus destroyed before the middle of November. Trial was also made of the moth-traps produced by Messrs. Andres Maire et Cie., Alexandria, and containing «Prodenine», an attractive liquid specially produced to destroy the moths of *Prodenia litura* (*littoralis*), whose caterpillars attack cotton in Egypt. Over two thousand female *Agrotis* moths were caught in one trap during November. As a result of these measures it is claimed that over six thousand acres of crops were saved. Further and extended trials of these traps and of hand picking will be made,

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(1) See also No. 1369, *B.* Sept. 1912. (*Ed.*).

(2) See No. 83, *B.* Jan. 1913. (*Ed.*).

INSECTS INJURIOUS TO VARIOUS CROPS

194 - Notes on Insects injurious to Cotton in South Africa.

MOORE, W in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 5, pp. 714-720, 1 plate. Pretoria, November 1912.

Of late years, the cotton crops of South Africa have been much injured by insects; in some cases the loss has been as high as 75 per cent. or more.

From his recent observations, the writer describes the species harmful to the cotton plant and the methods of control which are at present in use.

The most important pests are *a*) the spiny cotton-boll worm (*Earias insulana*), known in the Sudan as the "Egyptian cotton-boll worm" and in India as the "spotted cotton-boll worm" (1); *b*) the common cotton-boll worm (*Heliothis armiger*), which often attacks peas, when it is known as the "pea worm," but also injures roses, carnations, and the young fruit of peaches, apricots, apples, plums, nectarines, tomatoes (tomato-worm), tobacco (tobacco-worm), maize (mealie-cob borer, not the mealie-stalk borer); *c*) the cotton stainer (*Dysdercus nigrofasciatus*); (2); *d*) the dusky cotton bug (*Oxycarenus laetus*); *e*) the cotton scale (*Pulvinaria jacksoni*); *f*) the cotton aphis (*Aphis gossypii*).

Besides the above-named insects, which are the most serious cotton pests so far noticed in South Africa, the cotton leaf roller (*Sylepta derogata*) (3) should be mentioned, also a species of leaf bug of the family Capsidae, the green stink bug (*Nezara viridula*) and the black-and-red stink bug (*Atelocera stictica*).

(1) See No 3048, *B* Aug.-Sept.-Oct. 1911.
(2) See No. 1975, *B*. June 1911.
(3) See also No. 656, *B* April 1912 (*Ed.*).

195 – *Conorrhynchus luigionii* and *Lixus junci* destructive of Sugar Beets in Campania, Italy.

ROSSI, ROMOLO. Alcune notizie intorno a due Cleonini, *Conorrhynchus Luigionii* Solari e *Lixus junci* Boh. (*Coleoptera-Curculionidae*), dannosi alla barbabietola da zucchero nella Campania. — *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura in Portici*, Vol. VI, pp. 26-42, plate I. Portici, 1912.

The damage done to sugar beets in Italy by *Conorrhynchus luigionii* Solari was observed for the first time during the spring of 1906 in some fields in Campania, whence in the space of a year this beetle spread throughout the neighbourhood. *Conorrhynchus luigionii*, in the adult state, devours with surprising voracity the leaves even of the youngest plants and in the larval form it destroys the pulp of the root.

Lixus junci Boh. appeared contemporaneously with the above mentioned pest in the sugar beet fields of the same district, and spread there more rapidly. This is due partly to the fact that it is able to fly and partly to its practice of attacking garden plants besides sugar beets. The chief injury is caused by this beetle when the beets begin to germinate, since the females deposit their eggs at this time in holes, which they excavate with their rostra in the stalks of the plants. Nearly all the beets thus attacked die, being actually cut in two. Other eggs are laid along the veins of the leaves when the plants have developed well. The larvæ, as soon as they hatch out, excavate long galleries in the roots, gnawing away a good deal of the pulp.

As a means of controlling both these beetles, the writer especially recommends seeking out the adults in their hiding-places : under stones or clods, in crevices of the soil and under leaves, thus entirely freeing the fields from these pests. As a supplementary measure only, the leaves of the beets may be treated with insecticides (different solutions of arsenic salts ; with a 4 or 5 % barium chloride solution ; arsenite of sodium at 1.5 % with the addition of 10 lbs. of flour to every 100 gallons of solution to make it stick ; carbon disulphide ; arsenate of lead from 1 to 1.5 % ; copper arseno-acetate at 0.15 %).

196 – Insect Parasites of *Atriplex hortensis*.

NOEL, PAUL. : Les ennemis de l'Arroche. — *Bulletin du Laboratoire régional d'Entomologie Agricole*, First Quarter 1913 (Jan.-March), pp. 6-8. Rouen, 1913.

The writer enumerates the numerous insect parasites of this kitchen-garden plant.

Coleoptera : *Mecaspis fasciatus* Müller, *Cassida margaritacea* Fb., *C. nebulosa* L.

Hemiptera : *Aphis papaveris* Fb., *A. atriplicis* Fb., another undetermined species of Aphis, two undetermined Psyllids, *Trioza atriplicis* Licht.

Lepidoptera : *Arctia caja* L., *Hadena oleracea* L., *Agrotis ianthina* Hb., *A. fimbria* Hb., *A. sigma* Hb., *A. plecta* Hb., *A. putris* L., *A. ripae* Hb., *Caradrina superstes* Tr., *Mycterophus punicea* God., *Mamestra peregrina* Hb., *M. chenopodii* Hb., *M. suasa* Hb., *Hadena atriplicis* Hb., *Hydroecia micacea* Esp., *Calocampa exoleta* L., *Brotolomia meticulosa* Hb., *Eupithecia subnotata* Hb., *Cidaria chenopodiata* S. V., *Gelechia naeviferella* Dup., *G. atriplicella* F. R., *G. obsoletella* F. R., *G. hermannella* Fb., *Heliodines roesella*, *Coleophora unipunctella* Zell., *C. binotatella* Zell., *C. flavaginella* Ill., *C. annulatella* Tenst., *Butalis chenopodiella* Hb., *Spermatophthora hornigii* Led., *Goniodoma auroguttella* F. R., *Pterophorus pterodactylus* L., *Coleophorus stephanii* Joannis and one undetermined moth.

Diptera : *Pegomyia hyosciami* Macq., *Asphondilia conglomerata* Stefani, *A. punica* Marchal, five undetermined Cecidomyids, *Stefaniella trinacriae* Stefani, *S. atriplicis* Kieff., *S. brevipalpis* Kieff.

Acari : *Eriophyies heinii* Nal., *E. brevipes* Nal., and one undetermined species of *Eriophyies*.

197 - Enemies of the Spinach.

NOEL, PAUL. : Les ennemis des Epinards. — *Bulletin du Laboratoire régional d'Entomologie agricole*, First Quarter 1913 (Jan.-March), pp. 13-14. Rouen, 1913.

A list of the parasites of this kitchen-garden plant :

Lepidoptera : *Arctia villica* Hb., *Amphipyra tragopogonis* L., *Heliodines roesella* L.

Nematoda : *Heterodera schachtii* Schmidt, *H. radicicola* Greeff.

Fungi : *Peronospora effusa* Grev. (1).

198 - The Elegant Grasshopper.

The Agricultural Journal of the Union of South Africa, Vol. IV, No. 5, pp. 753-755. Pretoria, November 1912.

Zonocerus elegans, the Elegant Grasshopper, known to many farmers as the " stinksprinkhaan," causes much damage every year in many parts of South Africa. In 1911, it was unusually abundant in parts of the Cape Province and of the Transvaal.

The insect is especially troublesome in gardens and orchards ; it is particularly fond of fruit and will attack almost any kind of vegetable, even including onions.

As the elegant grasshopper does not move in swarms, nor migrate far, its control is a local matter and its presence is little regarded by the Central Government.

Many insecticides have been used for its destruction, but the results have not always been satisfactory, owing to the dangers to plants and cattle which are incurred by their employment.

The most practicable way so far known of dealing with the pest in gardens, appears to be the collection of the young grasshoppers in nets (similar to butterfly-nets but of stouter material), or in an improvised bag. The insects should then be turned into a vessel containing a small quantity of paraffin floating on water. Thousands may be caught and killed in a few minutes in this manner.

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(1) See No. 579, *B.* March 1912 and No. 70, *B.* Jan. 1913. *(Ed.).*

199 – The Green Oak Tortrix in Italy.

CECCONI, GIACOMO. La Tortrice delle querce in Italia (*Tortrix viridana* L.) *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura in Portici*, Vol VI, pp. 308-319, figs. 1-6 Portici, 1912.

In 1911 for the first time a slow and continually increasing destruction of the oak leaves due to the attacks of the larvae of the Green Oak Tortrix (*Tortrix viridana* L.) was observed in the oak woods of some districts of Venetia, Romagna, Tuscany and the Marches. In 1912, the attack was repeated and with still more serious results.

This insect, which is widely spread in Central and South Europe, Finland, South Sweden and Norway and in Asia Minor, had hitherto only been observed in North and Central Italy; but according to the data collected by the writer, it is equally common in the South.

Sig. Cecconi gives a systematic description of the species, followed by some biological notes. The moth appears in Italy from the 20th of May to the 20th of June. The female lays its eggs around the buds, or in their vicinity; the eggs survive the winter and only hatch out in the spring, when the larvæ begin to devour the leaf and floral buds, and then attack the young foliage, of which they only leave the veins, fastening them together with silky threads. When the larvæ are full-grown, they devour the other leaves, only sparing a fragment here and there attached to the principal nerves. The leaves, or rather leaf-fragments, are fastened together and rolled, thus forming a shelter for the caterpiller during its moult. When about a month old, the caterpillar pupates within this envelope.

The trees of an entire forest may be completely defoliated by these caterpillars, which sometimes devour even the axes of the catkins, which fall, and also the peduncle and base of the young acorns. This causes, if not the death of the tree, at least a hindrance in its development and hence in that of the wood, and brings about the loss of the fruit.

The measures of natural control which are most recommended are the protection of the insectivorous birds found in oak-woods (tits, warblers, finches, etc.) together with the protection and diffusion of the natural parasites of the pest. In 1911, the writer succeeded in breeding various Hymenoptera (seven Ichneumonids, one Braconid, two Chalcids), and three Diptera. The writer comes to the conclusion, from his examination of the material received in 1912, and from comparing the results of this year's breeding with those of 1911, that at present the Ichneumonids (and especially ***Pimpla maculator*** F.), which are the commonest parasites, are only found in Venetia. In Tuscany, on the other hand, there are Braconids and Chalcids, as well as some Diptera. No parasites were obtained from the material from the Marches, which however does not prove their absence in this district. If the Ichneumonids were numerous in the forests of Venetia, they, as well as the Braconids, Chalcids and Diptera, might with advantage be transported to other districts.

Artificial remedies have so far proved practically useless.

200 - *Rabdophaga saliciperda* damaging Willows in Italy.

CECCONI, GIACOMO La Rabdofaga distruttrice dei salici in Italia (*Rhabdophaga saliciperda* Duf). — *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore in Portici*, Vol VI, pp. 320-330, figs 1-3, plate II. Portici, 1912

The Willow-wood Midge (*Rhabdophaga saliciperda*) was discovered in 1841 in France, Austria and Germany. The writer was the first to record its occurrence in Italy — in the Province of Florence, in 1910, on *Salix alba* L. Outside Italy, this midge attacks other species of willows and also *Populus alba* L.. It is injurious only in its larval condition, when it tunnels into the wood of young trunks and branches. At first the cortex of these portions remains intact and of the same colour as unaffected parts, while the exterior has an irregularly undulating, mammilated appearance. Gradually the colour of the cortex changes, becoming a reddish-brown, and slight longitudinal cracks appear. The cortex continues splitting longitudinally, and when the time for swarming comes, it appears completely perforated, becoming continually darker; then it dries up and gradually becomes detached, and the fragments fall to the ground. Thus the cavities made by the larvæ are exposed to view, and the wood assumes a blackish colour.

In the meantime, the tree has begun to react, forming a cicatrice all round the zone occupied by the cavities of the larvæ. As, however, the females prefer laying their eggs around the injured zone, the destruction continues in the second, the third, and even the fourth year, provided the trunk and branches are of a sufficient size. In this case, the affected zone extends in length and width, so as to almost completely encircle the trunk, or branch, which then breaks off at this point. The upper portion of the larva-infested zone withers very soon, so that the thin stems and the branches break off directly after the first or second year's attack.

So far, no parasites of *Rhabdophaga saliciperda* had been mentioned, but the writer, in three years' consecutive breeding, obtained five belonging to the Hymenoptera (*Platygaster* sp., *Eutelus* sp., *Tridyminarum* sp., *Torymus tipulariarum* Zett. and *Eurytoma* sp.), which will be described in another work.

As a remedy against the midge, it has been recommended to cover the infected parts of the tree with a viscous substance, so as to prevent the exit of the pupæ and the adult insects. The infected parts may also be cut off and burnt.

According to the writer, use can be made of the five above-mentioned parasites and especially of *Torymus tipulariarum*, which increased so much from 1910 to 1912, that it alone destroyed 60 per cent. of the larvæ of the midge in some trunks and branches.

201 - An Insect Pest of the "Currajong" *(Brachychiton).*

FRENCH, C. Junr. in *The Journal of the Department of Agriculture of Victoria, Australia,* Vol. X, Part 11, p 662, 1 plate. Melbourne, November 1912.

The "Currajong" (*Brachychiton populneum* R. Brown = *Sterculia diversifolia* G. Don), is much cultivated in Victoria (Australia) as an ornamental tree in large private gardens, public parks and avenues, etc. In times of drought, in some parts of the interior of Australia starving stock have been saved by eating the leaves of these trees and also the roots, if they happened to be exposed.

A Psyllid, *Tyora sterculiae* Froggatt, attacks the leaves of the "Currajong," which causes them to become discoloured and spoils the appearance of the trees themselves. The parasite was first discovered at Forbes, New South Wales.

The most effective means of dealing with this pest is to spray the trees with kerosene, or benzol emulsion, pine oil spray, or any other mixture which kills insects by contact.

RUGGERI ALFREDO — *Gerente responsabile.*

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of January and February 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

Agricultural Economy of Japan: Principal Features; Present Conditions of Production.

by

DR. YOKOI (TOKIYOSHI)

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In giving the following description, the author takes as geographical limits the so-called "Old Japan," that is, the Main Island, Shikoku, Kyushu, and the small islands, but not Hokkaido, the Loochoos, the newly acquired domain in Formosa, nor the continental colonies.

Since the Country is so greatly extended from south to north, the agricultural products obtainable within the limits of "Old Japan" are quite numerous, including many of a sub-tropical nature side by side with the staples of the temperate zone

Moreover, varied formations of underlying rocks give rise to so many kinds of soils, that the full study of the agronomy of the Country is, as may be readily supposed, by no means an easy task.

In one point, however, every part of the "Old Japan" is alike, and that is in the great number of small farmers on holdings that are perhaps too small. It is a striking fact and one strange for so old a country, that, excluding Hokkaido, only 17.5 % of the total area is under cultivation. Putting the population at 50 000 000 of which 60 % belongs to rural population, it is no wonder that the average size of a farm on which a family with 4 to 7 members must subsist, is only 1 *cho* (2 ½ acres). This gives rise to an intensive system of farming, or rather of cultivation, for little is done in the way of raising livestock except in hilly districts or on waste lands that cannot easily be tilled.

The so-called "Areas under Cultivation," which are by far the most important from an economic point of view, are mostly devoted to the cultivation of cereals and other important staples, and not to forage crops. Evidently, much labour is needed and fertilisers must be abundantly used for this purpose. The system of land tilling remains primitive and the work is done mostly by hand, although the use of domestic animals for agricultural operations is so needed. Farmers do not venture to purchase efficient farm implements of modern type, as they are too expensive and they might not pay. In one word, the hand is the principal factor in cultivation, and "Spade Farming" is an apt designation of the system of farming throughout the Country.

Cultivation of grain crops. — Rice is the most important and the most extensively cultivated crop, the acreage of "ta" or paddy fields, the land specially devoted to it, being 2 880 000 cho, that is more than half of the total area under cultivation, estimated at 5 660 000 cho including Hokkaido and the Loochoos. Moreover it is cultivated in ordinary or upland fields where upland rice is grown. Indeed in paddy fields a few other crops such as rushes for matting are cultivated to some extent instead of rice, but in warmer parts rice is often grown as their after crop too.

The greatly increased price of rice may make it feasible to bring under cultivation waste areas which have remained so owing to lack of water for irrigating purposes. An outlay of capital for irrigating ditches would bring a large area into use for the production of rice. Even now, the slopes terraced high up for the cultivation are one of the striking features in the landscape of the Country. Where water is available, the rice field is never absent, although in the northern sections of the Empire the industry is risky as the summer is not sufficiently long, the middle of Hokkaido, or more exactly 44° N. being the limit of this crop.

The labour necessary for laying out of rice field, sowing, transplanting, weeding, and harvesting is that of 20 to 40 hands for an area of 1 *tan* (1/4 acre); a good yield for one *tan* is 3 *koku* (1 *koku* = almost 5 bushels) or even to 4 *koku* on the best fields.

The average annual crop of rice in Japan is considered to be 50 000 000 *koku*; the actual production is, however, somewhat larger than the above figure, as farmers generally hesitate to give the exact yield.

Out of the total area of "ta", nearly 39 % can be dried up in the winter months and planted with other crops, such as barley, rape-seed, green manure, etc., thus securing two crops a year from the same ground. The remaining larger portion, 61 % of "ta" may be reckoned as wet all the year round, and this might be turned with advantage into "Dry Paddy Fields" by introducing a suitable system of drainage.

Next to rice in importance comes barley. This cereal is cultivated almost throughout Japan and is of two kinds, — the naked and the ordinary varieties. The former has for its zone the whole of the southern part of Japan, while the latter is extensively cultivated in the rest of the Empire. Unlike in Europe, this cereal forms here a staple food-stuff of the people, especially among the agricultural portion; it is likewise used to feed horses and is made into malt, since beer brewing has come into considerable importance

Other cereals such as wheat, millet, foxtail, Italian millet, barnyard millet, and buckwheat are also raised. Maize is cultivated almost alone in mountainous districts and there it is a staple article of food.

Leguminous products such as peas, soy-beans, kidney-beans, and red-beans (*Phaseolus radiatus*) are among the important crops. Among root-crops, sweet potatoes, *daikon* (a sort of radish), the taro root (colocasia) and potatoes are widely raised. Sweet potatoes thrive wonderfully in the southern provinces, while *daikon* is extensively cultivated all over the Country. The former is a regular article of diet in many of the producing provinces, and so is the latter in the cooler parts of the Country.

Cultivation of Industrial Plants. — "Intensive farming" naturally necessitates the cultivation of such industrial plants as assure a higher remuneration than ordinary food crops. The areas so used are quite extensive and come up to 4.82 % of the total area under cultivation, which is greater than that in other countries similarly situated. Tea, which is grown principally on hilly districts as well as in ordinary fields, is an important article of commerce, and is universally used for making the national beverage.

Tobacco culture is not without importance; since the introduction of the state monopoly, the area devoted to it has decreased although the value has not suffered any reduction.

Sugar cane is still cultivated in many places, but it has lost its former importance. So also has cotton in a greater degree, though efforts are being made to grow it in some parts of the Empire.

Vegetable wax, which is obtained from the berries of the rhus tree, is produced in the warmer parts of the Country on land of little value.

As to indigo, as may be supposed, the substitution of artificial indigo has considerably demoralised the market, and has reduced the area under cultivation.

Among textile plants, hemp retains its importance. Lately, the cultivation of rushes in the manufacture of matting is becoming a paying business, especially in the western part of the Country. The finished product thus made is steadily finding an increasing market both at home and abroad.

Osiers are produced for making into baskets, light portmanteaus, etc. Osiers are grown both on wet and dry land.

Among oleaginous crops, rape comes foremost in the list. The plant was once cultivated in upland fields, but in these days it is grown mostly on rice-fields as a second crop. Owing to the use of petroleum and other methods of lighting, rape-seed oil has lost its old position of importance as an illuminant.

We have elsewhere referred to the fact that no forage crop of importance is produced. In place thereof, however, we have the leaves of the mulberry tree used in feeding silk-worms. Needless to say, there is not a province where the cultivation of this valuable tree is possible in which silk-worms are not raised.

Live Stock. — Among domestic animals, horses and cattle are by far the largest in number. They both do great services as beasts of burden and in agricultural operations. Cattle are, however, far smaller in number than in other countries. Cows are generally put to work in tilling land.

As to the dairy industry, its importance is far behind that in European countries. A limited number of milk-men are found in urban districts only to furnish the city people with fresh milk. Cheese and butter are too little to be of any significance.

Many farmers who have been hitherto exclusively occupied in the cultivation of rice and other field crops are now turning their attention to the more profitable live stock. The fattening of domestic animals, which has been little practised so far in the Country, has been introduced in a few localities and promises a good future.

As referred to in the first part of this treatise, both horses and cattle are raised mostly in mountainous districts, where land is less valuable or where the cultivation of rice is hardly possible. Particular mention of horse raising is unnecessary here. Calves are generally sold before they are a year old; they are bought and reared for some time by farmers in the plains and they are resold. They often change hands three or four times before attaining their full maturity. Goats and swine are now being raised in many provinces

The Poultry and Other Industries. — The poultry industry is coming into vogue among farmers as a secondary one, although still a large proportion of eggs is imported from neighbouring countries, especially from China.

Fish are raised in many places. Carp, which are highly prized as an article of food, are successfully propagated in rice fields; while these are still covered with water in the early stages of rice cultivation, there is sufficient water for young fish.

Sericulture, or cocoon culture, is carried on all over the Country and is a valuable resource of the people and the country at large Some of the farmers reel their cocoons themselves, but most of the cocoon raisers sell their products to the middlemen who resell them to the filatures. The industry which is so lucrative from one point of view is not without its evils from another, for the profits are such that nowadays many who were formerly steady thrifty country people have formed luxurious habits which are most injurious to them. The production of bivoltine and trivoltine cocoons is increasing very fast, but the continued taking of leaves is liable to impoverish the soil. In many places the co-operative method of rearing worms has been adopted, the worms being cared for by experts until the third stage is reached when they are divided among the farmers.

Other Secondary Industries and By-Products. — Peasants are generally engaged in different sorts of minor industry, beside their work in the fields; some earn money by jobbing while others engage in work as mechanics during their leisure time. Rice-straw is much used in all sorts of work and many find occupation in making ropes, sandals, etc., during their leisure hours. The plaiting of barley straw into braid for the manufacture of hats is done by the women and children of the rural population. These products command a good price both in the domestic and the foreign markets. One reason why farmers in this country make an abundant use of fertilisers is the utilisation of straw and the consequent exhaustion of the soil.

Weaving is still done by the women in some places; paper-making, silk-reeling, the weaving of matting, plaiting of chip braids, basket work, and wood working are other minor industries, in which the agricultural population find occupation for their leisure time. These industries should, of course, be studied and watched by parties interested in rural economy.

Summing up what we have said, we conclude that the area under cultivation in this country, even in the densely populated parts, is comparatively smaller than in any other old country. This is due principally to the mountainous nature of the Country which reduces the arable area. The minute division of the land hinders the use of efficient agricultural implements; and the little attention paid to the raising of domestic animals makes much of the hilly land of no use.

The greater part of the farmers who cultivate paddy fields only are not provided with land enough to occupy their time when two crops are raised on the same rice field, as in the warmer portions of the Country. The busy time is limited to two periods of the year, and the cultivators have the rest of their time at their disposal. In those places where there is no rice-land, or where dry fields predominate, the farmers have their time better occupied in their work than is the case with the cultivators of rice fields only. The holders of dry upland fields must get their living in part by engaging in the cultivation of industrial plants or other special crops; for the cultivation of cereals alone, with the exception of rice, is not sufficient for the support of their families. Thus, we are disposed to believe that the best form of land holding for a farmer is a combination of wet and dry land in such degree, that his labour can be used to the best advantage. Peasants who have not sufficient land to work for themselves must naturally engage in day labour or must get their living by occupying themselves in minor industries. Along the sea coast or in lake districts, they engage in fishing; and in mountainous districts they engage in forest work.

Below we append data on principal crops with the acreage, including Hokkaido and the Loochoo Islands, for the year 1910 (1911*).

Crops	Acreage		Production			
	cho	acres				
Rice	2 949 439	7 226 126	46 633 376	*koku*	231 536 040	bushels
Barley(*)	598 565	1 466 484	9 385 818	,,	46 580 876	,,
Naked barley(*)	667 234	1 634 723	7 505 811	,,	37 250 589	,,
Wheat(*)	499 204	1 223 050	5 009 840	,,	24 863 335	,,
Foxtail millet	189 474	464 211	2 092 699	,,	10 385 856	,,
Barnyard millet	61 231	150 016	775 315	,,	3 847 811	,,
Maize	53 300	130 585	722 429	,,	3 590 306	,,
Buckwheat	156 591	383 648	1 311 575	,,	6 509 216	,,
Soy-bean	478 137	1 171 436	3 396 716	,,	16 857 562	,,
Red-bean	141 074	345 631	965 796	,,	4 793 149	,,
Sweet potatoes	283 207	718 357	832 877 987	*kwan*	6 871 243 393	lbs.
Potatoes	68 384	167 541	179 397 660	,,	1 480 030 695	,,
Radishes	104 681	256 468	657 489 683	,,	5 424 289 885	,,
Rape-seed	138 446	339 193	1 048 051	,,	8 646 421	,,
Tea(*)	50 213	123 022	8 151 413(*)	,,	67 249 157	,,
Tobacco	29 724	72 824	10 996 866	,,	90 724 144	,,
Mulberry	450 550	1 103 847				
Hemp	12 317	30 177	2 430 210	,,	20 049 232	,,
Rush for matting	3 704	9 075	8 839 906	,,	72 929 224	,,
Shititoi (another kind of matting)	2 225	5 451	3 894 848	,,	32 132 496	,,

Live Stock		Number
Cattle		1 384 183
Horses		1 564 643
Pigs		279 101
Fowls	Mature	12 503 196
	Young	8 145 412

Cocoons (weight). 3 900 962 *kwan*. (45 382 893 lbs.)

Green manure . . 380 537 cho (930 940 acres) 1 056 770 284 *kwan* (8 718 354 843 lbs.

(*) Manufactured.

Recent Investigations at Rothamsted.

by

Dr. E. J. Russell

Director of the Rothamsted Experiment Station, England.

For many years before their death, Lawes and Gilbert devoted their attention exclusively to crop production, and this policy has been adopted by their successors. Investigations at Rothamsted are now restricted to soil and plant nutrition problems, and no attempt is made to deal with such subjects as plant breeding, animal husbandry, etc., for which provision is made elsewhere. A further feature of Rothamsted is that it has no local duties to perform; the Staff are not called upon to analyse fertilisers or feeding stuffs, to advise, or to conduct demonstration plots of an educational nature.

The limiting factor in crop production in England is commonly the nitrogen supply; it very generally happens that an increased application of a nitrogenous fertiliser leads to increased crop yields. For this reason fertility problems in this country often resolve themselves into questions of the nitrogen supply, and such questions therefore claim a very large share of attention. Of course the other factors are borne in mind as well, but the keynote to much of the work is the necessity for understanding more fully the nitrogen cycle in the soil with a view of ultimately controlling the changes that take place, reducing the losses and increasing the production of ammonia or of nitrates.

The second line of investigation has to do with the possibility of the stimulation of plant growth as apart from plant nutrition. Is it possible to find substances which are not themselves nutrients but which will stimulate the plant to greater activity in assimilating the nutrients from the soil or in those photosynthetical processes that enable it to utilise the carbon dioxide of the atmosphere? This work is complicated by the difficulty of finding an exact definition for a nutrient on the one hand, and eliminating secondary effects on the other.

Lastly, investigations are being started on the influence of soil conditions (manures, etc.) on the composition of the crop. In England considerations of quality of the crop play a very prominent part; the feeding qualities of root and hay crops, the malting quality of barley, the baking quality of wheat being all matters of importance in determining the prices. Usually the ordinary analytical processes afford but little guidance to the chemist, and quality depends as a rule on some factors that have hitherto escaped us. As a first step in these investigations it has become necessary to ascertain more closely what substances are present in the crop and to what variations they are liable with change of conditions. This aspect of the work is being developed exhaustively, as it must form the basis of any true elucidation of the rather vague characters summed up in the word quality.

So much for the general outline of the recent Rothamsted work. We can now turn to details of some of the investigations. Considerable attention has been paid to the conditions under which the production of plant food, and especially of ammonia and nitrates, goes on. It has been shown that the process is mainly the work of bacteria, but that in normal soils the bacteria are not working at their maximum efficiency. A factor has been discovered limiting the numbers of bacteria and therefore the amount of decomposition they effect.

All the available evidence goes to show that this factor is biological: it is capable of growth, is put out of action by heat or antiseptics and can only be set up again by infection from outside: it does not, however, appear to consist of bacteria, and is provisionally identified with the protozoa, of which numbers have been found in all the soils examined. Partially sterilised soils from which the factor has been extinghuished are found to cortain larger numbers of bacteria than untreated soils and to accumulate ammonia and nitrates at a greater rate : they are, as might be expected, more productive. Methods are being worked out for applying this kind of soil treatment on the large scale, but instead of setting up a large number of field plots to discover some cheap and convenient process, the simpler alternative is adopted of inducing horticulturists who go in for intensive culture to adopt some of the methods known to work. This has proved very satisfactory and has led to a considerable cheapening of the method, besides revealing some of the difficulties attendant on its application on the large scale.

The laboratory investigations are proceeding on two lines. A number of obscure soil problems are being examined and cleared up in the light of this new conception of the existence of two opposing sets of organisms. For example, changes in soil temperature are known to have but little effect on the numbers of bacteria; this has been traced to the presence of the detrimental organisms, for in partially sterilised soils from which they are absent the bacterial numbers show the normal change with changing temperature. " Sickness " in greenhouse soils and in sewage soils has afforded some interesting studies which have demonstrated that the detrimental organisms are an important factor in bringing it about. Indeed it seems to be a general rule that conditions favourable to active life in the soil may become unfavourable to productiveness through encouraging the detrimental organism, while conditions temporarily unfavourable to active life may be beneficial to productiveness through destroying them.

Further light has been thrown on the action of lime on the soil. It has been shown that dressings of lime sufficiently heavy to kill protozoa cause a marked increase in bacterial numbers and in the rate of production of plant food, the phenomena being entirely similar to those produced by other methods of partial sterilisation.

This new conception is proving very useful in clearing up old difficulties. A zoological survey of the soil fauna is being made by Mr. Goodey, and as the organisms are picked out they are studied to see whether it is likely that they could lead a trophic life in the soil or whether they are there only as cysts. A large number of organisms are being found and the work is evidently going to take considerable time, but it will we hope lead ultimately to the actual identification of the detrimental organisms.

The problem of nitrogen fixation is also under investigation. When land at Rothamsted is left in grass, or allowed to cover itself with wild vegetation, its percentage of nitrogen rapidly increases. How much is due to symbiotic fixation and how much to the free living Azotobacter is not easy to decide, but Dr. Hutchinson has shown that, under the conditions actually obtaining, Azotobacter can fix considerable quantities of nitrogen. The percentage of nitrogen present in a mixture of sand and crop residues increased when cultures of azotobacter and cellulose-decomposing organisms were added, but not otherwise. Growing plants were able to utilise the nitrogen thus fixed. Again, when sugar was added to some of the nitrogen-starved barley plots, an increased crop was obtained similar to that which a dressing of nitrogenous manure would have given. This results however, was only obtained when the sugar was added in the warm autumn weather; in cold spring the sugar had a deleterious effect.

The gains and losses of nitrogen compounds by rain and drainage water have long been under investigation at Rothamsted. Analyses made on a systematic plan by Dr. Miller have shown the low amount of nitrogen compounds in rain collected at out-lying lighthouses, and the uniform and somewhat higher amount contained in rain collected in country districts. In towns, however, a larger quantity is present. About 4 lbs. of nitroge: per acre is thus brought down each year to the soil. The losses by drainage are much more serious. Lysimeter experiments continued over a period of 25 years and still going on, have shown that about 50 lbs. per acre of nitrogen compounds, chiefly nitrates, were lost each year in the drainage water for the earlier part of the period, and about 35 lbs. later on. The lysimeters are kept without crop or manure, and are uncultivated except in so far as is necessary to remove weeds. When last the percentage of nitrogen in the soil was determined, the loss of nitrogen was found to be practically equal within the error of experiment to the amount of nitrogen recovered in the drainage water. Under these conditions, therefore, the essential change in nitrogen compounds appears to be confined to ammonia production and nitrification. But on the cropped plots where large quantities of manure are added other losses appear to go on, which are now under investigation.

We now pass on to the plant work. The amount of growth a plant makes in a given soil is known to depend on the amount of food supplied, and this relationship forms the basis of the connection between the plant nutrition work and the soil work. But a hypothesis is current, and is backed by sufficient circumstantial evidence to make it worthy of consideration, that inorganic plant poisons act as stimulants to growth if supplied in sufficiently small quantities. If this hypothesis were well founded it would introduce a wholly new set of factors into plant nutrition relationships, and would, in addition, form a basis for important practical developments. Very careful water cultures have therefore been made by Dr. Winifred E. Brenchley to test this hypothesis as completely as possible. The compounds tested have been copper sulphate, manganese sulphate, zinc sulphate, sodium arsenite, arsenious acid and boric acid, and a wide range of concentrations has been adopted. Numerous plants have been tried, but on the whole barley and peas have proved most satisfactory. Copper sulphate was invariably toxic even in such high dilutions as 1 part of salt to ten million of water. The effect varied, however, with the plant and was somewhat masked in presence of nutrient salts. It is not entirely simple. The fact that boric acid decidedly increased the growth of peas, but never that of barley, raises the interesting question whether boron is in some way advantageous to the pea and therefore to be regarded as a nutrient. Some specific effect is clearly indicated and the hypothesis is shown not to hold in its general form.

Starting from the other end, *i. e.* from the soil, an attempt has been made to ascertain whether any toxins are thrown off from the roots of plants that will adversely affect succeding crops. A hypothesis to this effect has long been current, and has been defended by the United States Bureau of Soils. Plants have therefore been grown in succession in the same pots of soil, year after year, and their yields have been compared with those obtained when a rotation was adopted. The results were entirely negative and no systematic difference could be observed : we are forced to conclude that if any toxic property is developed in soil by the growth of a crop its effect is transient and does not persist long enough to affect a subseqrent crop. So far our attempts to find toxins in the soil have resulted in failure.

An important piece of ecological work has been carried out by Dr. Brenchley, in tracing the relationship between the weeds of arable land and the soil and the crop. A definite association was found to exist between the weeds and the soil, the determining factor being, however, the texture of the soil rather than its geological origin, excepting only in the case of the chalk soils. The association was sometimes so close that it extended over a wide area ; thus *Euphorbia exigua* and *Ranunculus arvensis* were always seen on heavy loams or clays. Sometimes, however, the association is affected by climatic or other factors : thus *Matricaria inodora* was common on clay in Bedfordshire but absent near Bath. The two cases are distinguished as General and Local Association. Very few plants, however, could be said to be symptomatic of soil conditions in the sense of being restricted to any one type of soil ; but a good many plants are characteristic, *i. e.* are more frequently found associated with one soil than with any other. *Rumex Acetosella, Spergula arvensis* and *Scleranthus annuus* may be regarded as symptomatic of soils giving no carbonate reaction with dilute hydrochloric acid. A relationship also exists between the weeds ard the crop : *Plantago lanceolata* and various species of *Geranium* are very common in temporary grasses ("seeds" crops), while *Poa annua, Polygonum auriculare* and *P. Convolvulus* are very rare. No doubt the conditions of cultivation account for this. It is surprising how many of the weeds belong to the *Compositae*, at least half the genera of this order providing species of weeds ; on the other hand *Rosaceae* and *Leguminosae* supply very few weeds.

The larger problem has been investigated of tracing the relationship between the system of agriculture practised and the soil types as characterised by mechanical and chemical analysis. The South Eastern portion of England was selected as the area of examination, and various correlations were traced between the analytical data and the properties of the soils. Consideration of these, however, is best deferred until the conclusion of similar surveys which are being undertaken in other parts of the country.

The third division of the work, dealing with the composition of crops, has only recently been undertaken. Mr. Davis has begun with the sugars and has made a careful survey of the methods in use for estimating them in plant products. The analytical difficulties are very considerable, ard unsuspected sources of error have been revealed in some of the methods in use. In particular the necessity for using basic lead acetate in relatively large proportions for the purpose of eliminating amino-acids, tannins, etc., and the subsequent removal of the lead by sodium carbonate, gives rise to difficulties in estimating cane sugar because the sodium acetate thus formed protects it from inversion by weak acids. Objection can similarly be raised against other methods ; but the progress that has been made up to the present fully justifies the hope that a satisfactory solution will be found of the various difficulties encountered.

In conclusion, it may be stated that no bulletins are issued from Rothamsted. The scientific papers dealing with Soil Fertility in any of its aspects, chemical or bacteriological, are published in the Journal of Agricultural Science : those dealing with the botanical side are published in the Annals of Botany. Papers intended for farmers are published in the Journal of the Board of Agriculture.

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The Present Organization of the Meteorological Service in Italy.

by

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In Italy the Meteorological Service is directed by the Royal Central Meteorological and Seismological Office in Rome, which depends from the Ministry of Agriculture, Industry and Commerce.

In a paper under the title of " Meteorology and Seismology ", which is one of the monographs collected in the work published under the auspices of the Government and of the R. Accademia dei Lincei on the fiftieth anniversary of the proclamation of the Kingdom of Italy (1), I had occasion to draw up the history of the Meteorological Service in Italy from its inception, through its successive stages of development, to its present form. In this paper I shall not refer to the past, but shall limit myself briefly to the actual state of the organization of our service.

State network of meteorological observatories. — The Government network consists of observatories, of temperature and rainfall stations and of simple rainfall stations. In the observatories observations are made of all the principal elements of climate : barometric pressure, temperature and moisture of the air, direction and velocity of the wind, cloudiness, cloud forms, and rainfall. The most important observatories possess, besides the usual non-recording instruments, the various apparatus that register pressure, temperature, hygrometric conditions (generally self-registering instruments of the Richard type are adopted), rainfall (Richard or Palazzo type), hours of sunshine (Campbell Stokes heliophanograph), wind (anemometroscopes registering by mechanical or electrical means, Brassart's types). The temperature and rainfall stations are provided only with rain-gages and maximum and minimum thermometers ; they record also the direction and estimated force of the wind and the state of the sky. Lastly, the rainfall stations limit themselves to observations on the fall of rain and of snow.

Many of the observatories are attached to higher or medium educational institutions, among which we include university astronomical observatories, which carry out as a rule also ordinary meteorological observations ; but the greatest number of the stations are conducted by private persons, schoolmasters, municipal secretaries, parish priests, monks, managers of estates, etc. The practical schools of agriculture also, but not all of them, have meteorological observatories, and the semaphores of the Royal Navy and the port captains' offices also forward meteorological data to the Central Office.

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(1) *Cinquanta anni di storia italiana* (1860-1910). Tip. della R. Acc. dei Lincei, Roma 1911.

The above-mentioned university observatories and the five Royal Seismical Observatories: Rocca di Papa, Ischia, Catania, Pavia and Salò, are supported by the State, as well as the mountain observatories on Monte Rosa, at Sestola-Cimone and at Tiriolo (Catanzaro), but beyond these three there are in Italy no other exclusively meteorological observatories, directly and entirely supported by the Government. A few of the observatories of the network are in receipt of subsidies from the Communes or Provinces; but on the whole it may be said that the service of our meteorological stations is performed gratuitously, inasmuch as the Government grants only small subsidies as compensation or for the upkeep of the observatories and which in no case can be considered as salaries for the persons entrusted with the observations.

In almost all the capitals of the provinces there is a principal observatory, the director of which has the high surveillance over the temperature and rainfall stations which form the provincial network.

According to a list drawn up on January 1, 1913, there are in Italy 177 observatories, 314 temperature and rainfall stations and 112 simple rainfall stations; these latter are established by the provincial offices of the State Civil Engineers and by improvement contractors and associations. Considering also about 30 stations belonging to agricultural schools, port authorities and semaphores, which register rainfall readings, the total number of rain-gages in Italy is at present 630.

As for the most part observatories and stations have been founded by private initiative, it was not to be expected that the distribution of our stations would be very uniform; indeed, while in several districts, like the valley of the Po and the Salentine peninsula the stations are very close to each other and sometimes more numerous than necessary, in other regions they are scarce. This, for instance, is the case in the province of Grosseto, in Calabria and in Sardinia. It would be especially desirable to have a greater number of stations for the record of rainfall particularly in the mountainous parts of the country, which would be very valuable for the study of the rivers and for the utilization of their water.

The Central Administration intends, as soon as the means at its disposal allow it, to increase by about five hundred the number of rain-gages, distributing them in those districts where they are least numerous.

The regulation hours for ordinary meteorological observations for our network of observatories are 9 a.m., 3 p. m. and 9 p.m.; besides which those observatories that have to send off telegrams in the morning for the weather forecasts, make their observations at 7 a.m. A few observatories and some semaphores take a supplementary observation at 11 a.m. and forward it by telegram to the Central Office.

The three observations of every day are written on special forms and are sent to the Central Office every ten days; while the temperature and rainfall stations use monthly forms, that is they are sent off at the end of every month. Similarly on the last day of each month the Offices of the State Civil Engineers send the Central Meteorological Office a copy of their rainfall readings.

Distribution of the duties in the Central Meteorological Office; Section of Climatology. — The Central Office, besides the Secretary's Office which attends exclusively to correspondence and to administrative affairs, has divided its work into five sections: Climatology, forecasts, agriculture and storms, physics, seismology. Every section is directed by a head meteorologist, a doctor in physical science, assisted by some technical officials or compilers, who are eight in number, all told; in truth they are too few and quite insufficient to meet requirements.

The duties of the climatological section consist in working up the data collected by all the observatories and meteorological stations of Italy, calculating the averages for the ten days, month and year, tabulating observations and publishing them in the *Annali dell' Ufficio centrale meteorologico e geodinamico*, of which more hereafter. The head of this section devotes himself especially to climatological studies and prepares monographs on the various elements of the climate of our country.

Telegraphic meteorological and weather forecast service. — The so-called weather forecast section draws up the daily telegram on the state of the weather and on its forecast, and attends to the preparation of the *Meteorological Bulletin* which is issued every day on lithographed sheets.

For this purpose the section receives the telegrams which forward the observations made expressly for it at 7 a. m. in 73 Italian observatories, besides similar observations of 54 foreign observatories. With these data the isobar and isotherm charts which serve as a base for the weather forecast are drawn up.

The Daily Meteorological Bulletin is published as a four-paged lithographed sheet, illustrated by three maps: one shows the isobars at 7 o' clock in the morning on Italy and on the neighbouring Mediterranean countries (the east of Spain, France, Switzerland, Austria, the Balkan peninsula, Algeria and Tunis) with graphical indications on the state of the sky and the sea, the rain, wind and storms; another one gives the isotherms at 7 a.m., also of the Mediterranean, with an account of the phenomena of the preceding 24 hours; and lastly another map on a smaller scale shows the isobars over the whole of Europe. In the three first pages of the sheet the meteorological information from the Italian observatories is given, grouped according to regions, and showing for each: the barometric pressure reduced to 0° C. and to sea level, and the difference from the readings of the previous day; the temperature and its difference from that of the preceding bulletin; the direction and strength of the wind, the state of the sky; the direction of the clouds, the state of the sea [at the maritime stations; the maximum and minimum temperatures of the preceding 24 hours; the amount, in millimetres, of the rain or snow fallen in the same time; lastly, various observations referring to special events, such as storms, gales, rain, snow, hail, etc., with indications as to the time of day in which the above took place. The fourth page contains the above-mentioned small isobar map of Europe, the text of the meteorological telegram and a table of the meteorological data in the various States of Europe; as well as those in Algeria, Tunis, Malta, Alexandria and Tripoli.

The meteorological telegram is drawn up about one o'clock in the afternoon and a copy of it is sent to the Central Telegraph Office for transmission to the capitals of the provinces, to the semaphores and to the port captains' offices. In this telegram a notice is given of the positions of the barometric maxima and minima over Europe; it contains also a summary of the weather in Italy during the preceding 24 hours and the meteorological conditions of the morning in Italy, the distribution of pressures and lastly the weather forecast. This forecast is intended generally for the next 24 hours. When storms at sea are expected, telegrams are sent as soon as possible to the semaphores and ports in order that the storm signals agreed upon by maritime conventions may be hoisted along the threatened shores.

The bulletin is lithographed and appears before the evening; it is sent by post to the Italian observatories, to many Government offices and public administrations free of charge; it is also sent in exchange to foreign meteorological institutions. There are also private subscribers to the Bulletin, who pay 16 Lire (12*s.* 8*d.*) per annum in Italy and 30 Lire (23*s.* 9*d.*) abroad.

Extracts from our bulletin are published in the *Gazzetta ufficiale del Regno*, as well as in the chief newspapers, often together with a small table containing the data collected at the Royal Astronomical Observatory of the Collegio Romano.

Lastly the telegraphic and weather forecast section of our Office attends to the international service consisting in forwarding telegraphically from Italy the meteorological data of a certain number of Italian stations, selected for the purpose, to the following foreign central meteorological offices and observatories: Paris, St. Petersburg, Triest, Vienna, Zürich, Hamburg, Athens, Madrid, Pola, Budapest, Sofia and Malta.

Agricultural and thunderstorm service; Meteorico-agricultural Review. — One section of the Office has the duty of collecting, ordering and working up the information concerning the thunderstorms which break out in Italy. This information reaches the Office by special uniform forms printed on cards which are filled in by the directors of the observatories and of the temperature and rainfall stations of the Government network and by other willing correspondents. On the basis of the observations thus collected the head of the section studies and draws up statistics concerning thunderstorms and hail in Italy, their distribution according to localities and seasons, their connection with the other elements of climate, etc. Besides which the present chief of the section is engaged on various kinds of research work connected with atmospheric electricity.

The same section attends also to the agricultural service, which consists in collecting and making extracts from special cards which are sent in by most observatories every ten days with brief news on the extreme temperatures, the cloudiness of the sky, the rainfall, with the addition of special information on the state of the fields, on the various crops and on the general progress of farming operations. With the help of this intelligence the *Meteorologico-agricultural Review*, which is published every ten days, is compiled. The Review includes a summary of the pressure in Europe and of the meteorology of each of the ten days in Italy; a recapitulation of the agricultural news for each of the regions of Italy, followed by another short summary for the whole of Italy; lastly the detailed information which reaches the Office by means of the cards of the various observatories, grouped according to regions and provinces. In the review a small map showing the true isotherms and the distribution of rain in Italy during the ten-day period is also published; sometimes, as an appendix, brief meteorological notes written by various authors are added.

Physical service ; magnetic chart of Italy. — The physical section of the Office deals with the examination and testing of the different meteorological apparatus which have to be sent to the observatories. The section has for this purpose a small physical laboratory, provided with the necessary instruments for measuring, and especially for testing thermometers and mercury and aneroid barometers. Besides which the assistant carries out research work on the physics of the atmosphere and of the earth.

In describing the distribution of the various branches of the Central Office the *seismological section* was mentioned. As its name implies, it deals with the study of earthquakes in Italy and with the publication of intelligence respecting them. But we cannot enter more fully upon this subject, as for the special nature of the periodical in which this paper appears the latter must limit itself to the subject of the organization of the meteorological service.

Publications of the Royal Central Office. — In the foregoing we have mentioned the official publications of our meteorological service, namely the daily *Meteorological Bulletin, the Meteorologico-agricultural Review*, which is issued every ten days, and the *Annals*. We will add a few words on the latter, which are the most important organ of publication of the Central Office.

In general, every volume of the Annals, corresponding to one year, is divided into three parts. The first part contains papers and original works by the scientific staff attached to the Office, and by other Italian meteorologists and students of physics of the earth. The second part is devoted to the publication of meteorological data collected by all the Italian observatories and worked up by the climatological service of the Office, as has already been stated. The third part contains similarly the data furnished by the temperature and rainfall and by the rainfall stations. Thus the second and third parts considered together form a valuable collection of meteorological data which can be used as a foundation for any study on the climate of Italy; while the first parts have included several important publications of a synthetic character on special elements of our climate, such as rainfall and temperature; papers on the other factors are being prepared. We attach special importance to these researches on the climate, inasmuch as they represent that part of the meteorological State service which has more directly practical ends in view and which admits of immediate application to social economics, to hygiene and to agriculture.

In this connection it may be mentioned that the General Direction of Statistics publishes every two or three years in the *Annuario Statistico Italiano* a series of tables showing the averages, for a certain number of Italian cities, of the climatic factors, drawn from the observations of many years, for which work the material collected by our Office is made use of.

Managing Board of the Meteorological and Seismological Service. — In order to complete the information on the organization of the Meteorological Service in Italy, the managing board has to be mentioned. It is the highest authority which superintends the whole of the service; it draws up resolutions, advises on the general measures to be taken, decides on the installation of new observatories, etc. All the more important questions, and those which entail greater responsibility in matters of administration and estimates, are submitted to this Board, which usually holds its session, which lasts several days, once a year. The Director of the Office reports to it upon his management. The Board is composed of six members besides the director; two of them represent the Ministry of Agriculture and one each the Ministries of Public Instruction, Marine, Public Works, and Posts and Telegraphs, which are the most interested in the meteorological service.

Italian Meteorological Society. — In Italy there exists, as in other countries, a Meteorological Society, which stimulates meteorological work, awakens interest in it and promotes the institution of new stations; its organ is the *Bollettino Bimensuale*, in which short papers, and meteorological intelligence and data appear. The Society's network cannot be considered as distinct from that of the State, as owing to the excellent relations existing between the President of the Society, Count Antonio Cittadella Vigodarzere, and the Director of the Royal Central Office of Meteorology, the stations which have been founded by the Society lend their services in the general interest and send copies of their data to the Central Office.

Manuring of Sugar Beets.
Present State of the Question in Germany.

by

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In Germany the only breeds of beets that are grown are those of Klein-Wanzleben origin, as this variety has proved superior to all others.

Anong the crops raised in Germany, the sugar beet is the one that gives the heaviest yields on the better class of soils. Thus where under the most favourable conditions with wheat and potatoes about 80 cwt. of dry matter are produced per acre, a sugar beet crop, under the same conditions, yields from 128 to 135 cwt. of dry matter per acre, exceeding even a crop of mangels. It is therefore evident that sugar beets require especially large quantities of plant food for their development. The greater part of this plant food is derived, under normal conditions, from the soil, the lesser from the manures.

Farmyard manure. — Like all root crops, beets are especially responsive to farmyard manure, by means of which notable increases of yield are obtained. Thus at the Lauchstädt experiment farm the following increases per acre were obtained as average of several years(1):

	Roots cwt.	Sugar cwt.	Leaves cwt.
With 12 tons farmyard manure	84.4	14.6	120.2
„ 8 tons „ „	71.2	12.9	81.3

Further, the yearly experiments at Lauchstädt show that the highest yields of sugar beets can not be obtained without farmyard manure. The yearly averages were (2):

	Cwt. per acre		
	Roots	Sugar	Leaves
4.0 cwt. nitrate 0.8 cwt. phosphoric acid 8.0 cwt. kainit	348.6	60.26	232.35
4.0 cwt. nitrate 0.8 cwt. phosphoric acid 8.0 cwt. kainit and stall-pit manure	425.0	70.18	292.01
4.0 cwt. nitrate 0.8 cwt. phosphoric acid 8.0 cwt. kainit and farmyard manure	400 7	68.20	292.25

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(1) VII. Report of the Experiment Farm at Lauchstädt, p. 41. *Landw. Jahrbücher*, 1910. *(Author's note)*.

(2) IV. Report of the Experiment Farm at Lauchstädt: 1902, pp. 18-19. *Landw. Jahrbücher*, 1902. *(Author's note)*.

From this it is seen that the heaviest crops cannot be obtained from artificials alone, even when given in maximum dressings. With these, the maximum crop was 349 cwt. per acre, while with the addition of farmyard manure 400 and 425 cwt. per acre were reached.

Considering the exceedingly favourable effect of farmyard manure on sugar beets, the farmer should use his available stock of this fertiliser as much as possible for beets. The most favourable quantity to be given may be set down at 8 to 12 tons at most per acre.

Green manuring. — To this form of manuring also sugar beets are very responsive, so that it is advantageous when circumstances allow it to grow sugar beets on green manure. At Lauchstädt the average of several years shows the increase of crop due to green manuring to be 47.8 cwt. of beets with 7.61 cwt. of sugar per acre(1).

The percentage of sugar was not perceptibly diminished by the green manure. If stable manure is given together with the green manure the former must not be applied too abundantly or a great waste of nitrogen would ensue, and the excess of manure would cause a greater diminution in the sugar content percentage.

Artificial manures. — *a*) *Nitrogenous manures.* — Among these the most important are nitrate of soda, sulphate of ammonia and the compounds obtained by electro-chemical processes, namely Norwegian nitrate of lime and calcium cyanamide. Sugar beets utilize best of all the nitrates, the action of which, under normal conditions, is not equalled by any other form of nitrogen, or even by sulphate of ammonia. The latter should be used only when a very heavy nitrogenous dressing is intended, which in the form of nitrate is likely to promote caking of the surface of the soil. In this case a combination of manures is advisable, giving one half of the nitrogen as a mixture of sulphate of ammonia and superphosphate (" ammoniaksuperphosphat ") in preparing the land and the other half in the form of nitrate as top-dressing. Instead of nitrate of soda the Norwegian nitrate of lime may be used, as many experiments(2) prove that it may be considered to be equal in value to nitrate of soda. Calcium cyanamide is not so advisable for sugar beets, at least on light soils(3). If, on account of its lower price, it is to be used on better soils it should be applied with nitrate.

As for the amount of nitrogen to be given, the following may be considered as normal quantities :

Without farmyard manure	3.2 to 4.0 cwt. nitrate
With farmyard manure or green manure	1.6 to 2.4 cwt. nitrate

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(1) V. Report of the Experiment Farm at Lauchstadt: 1904, p. 34. *Landw. Jahrbücher*, 1904. (*Author's note*).

(2) *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Parts 146 and 217. (*Author's note*).

(3) *Ibid.* (*Author's note*).

In the first case, if caking of the surface is to be feared, a part of the nitrate should be replaced by sulphate of ammonia (ammoniacal superphosphate).

It is well known that it is not advantageous to give heavy dressings of nitrate all at once when the seed is sown, but that it is preferable to divide the quantity in several portions, the last of which is generally given not later than June 20, and on light soils at the beginning of June.

b) *Phosphatic manures.* — Beets show a decided preference for the water-soluble phosphoric acid contained in superphosphates as compared with the less soluble phosphoric acid of basic slag. They especially require during the earliest stages of growth a certain quantity of easily assimilable phosphoric acid, so that superphosphates are always the best form to be used in the better kind of soils, and also on light soils it is advisable to give a portion of the phosphoric acid under the easily assimilable form of superphosphates.

The amount of phosphoric acid to be given, independently of the nature of the soil, depends chiefly upon the amount of farmyard manure that is used. The local farmyard manure contains an average of about 0.4 per cent. of phosphoric acid, so that a dressing of 8 tons per acre contains about 72 lbs. of phosphoric acid, which, as the Lauchstädt experiments show, has a most favourable effect, especially when the manure is the result of rich food. Anyhow, and this is proved by other experiments, the amount of phosphoric acid to be given may be considerably reduced if farmyard manure is used at the same time(1). The following may be considered normal quantities per acre :

Without farmyard manure	3.2 to 4 cwt.
With ,, ,,	1.6 to 2.4 cw..

c) *Potash salts.* — Sugar beets, like mangels and potatoes, are typical potash plants, but owing to their highly developed root system they possess to a greater degree than mangels and much more than potatoes the power of taking up potash from the soil. For this reason potash manures do not cause such high increases of yield with the sugar beet as they do with mangels or potatoes.

The amount of potash manures to be given depends, as in the case of phosphatic manures, chiefly upon the quantities of farmyard manure used. The latter contains an average of 0.7 per cent. of potash, so that with a dressing of 8 tons per acre, 125 lbs. of potash are given, namely as much as is contained in 8.76 cwt. of kainit. Consequently, when medium and heavy farmyard manure dressings are given to the better kinds of land, a special application of potash is often not necessary(1), while on light soils an addition of potash would not be out of place.

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(1) Reports of the Lauchstädt Experiment Farm. *(Author's note).*

Among the Stassfurt potash salts those most frequently used are kainit, sylvinit and "Hartsalz" (the two latter generally going also under the name of kainit) and the 40 per cent. potash salt. The amount of potash contained in 1 cwt. of 40 per cent. potash salt is the same as that in 3¼ cwt. of kainit. For plants which, like beets, respond to the other salts contained in kainit, 2 cwt. of kainit may be considered equivalent to 1 cwt. of the 40 per cent. potash salt. The following quantities per acre may be recommended:

Without farmyard manure, 4.8 to 6.4 cwt. of kainit or 2.4 cwt. of 40 per cent. potash salt; with farmyard manure, 0 to 4.8 cwt. kainit or 0 to 1.6 cwt. of 40 per cent. potash salt.

For applying this, the autumn is preferable to the spring, and on the better kinds of soils 40 per cent. potash salt is to be chosen.

The use of phonolite is to be strongly deprecated.

Influence of manuring on the quality of the beets. Influence of nitrogenous manures. — Every application of nitrogenous manures causes a certain decrease in the percentage of sugar. But with the improved varieties of beets which we grow now this decrease is not so considerable as to cause nitrogenous manures to be feared. The average diminution of sugar content observed during a long seies of years was as follows: (1).

With	green manuring	— 0.20	per cent. of the beet	
,,	farm yard manure, 16 tons per acre	— 0.39	,,	,,
,,	stall-pit manure, 16 tons per acre	— 0.57	,,	,,
,,	nitrate of soda, 4 cwt. per acre	— 0.50	,,	,,

Thus, even with these heavy dressings the decrease in the percentage of sugar was not considerable.

In numerous experiments on beets carried out in the province of Saxony on various kinds of soil, in which 1.6 to 3.2 cwt. of nitrate per acre and other nitrogenous manures containing corresponding quantities of nitrogen were used, no depression in the sugar content was observed (2):

Without nitrogen	17.1	per cent. of sugar in the beet		
With nitrate of soda	17.2	,,	,,	,,
With sulphate of ammonia	17.3	,,	,,	,,
With cyanamide	17.3	,,	,,	

It is thus ascertained that our recent resistant beet varieties can stand relatively high quantities of nitrogen without any consequent diminution of sugar worth mentioning.

Top dressings can also be carried out without hesitation provided they be applied not later than the 20th of June. The average sugar content observed during several years was the following (3):

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(1) II. Report of the Experiment Farm at Lauchstädt: 1907, p. 26. *Landw. Jahrbücher*, 1907. (*Author's note*).

(2) *Arbeiten der deutschen Landw.-Gesellschaft*, Part 146, p. 115. (*Author's note*).

(3) *Loc. cit.*, p. 113. (*Author's note*).

	3.2 cwt. nitrate per acre (the whole given at seeding time)	3.2 cwt. nitrate per acre (1.6 cwt. at seeding and 1.6 cwt. as top-dressing up to June 20)
Sandy soil	17.25	17.15
Sandy loam	16.10	16.25
Loam	18.15	18.05
Clay loam	17.25	17.20
Average	17.19	17.21

Consequently the practice of dividing large applications of nitrate of soda, where it seems advantageous, can be safely recommended, bearing in mind, however, that in general the last application must not be given later than June 20. On light soils, where the beet closes its period of growth earlier, the top-dressings must be given betimes.

Influence of phosphatic manuring. — It is still believed by many that phosphoric acid increases the sugar content of beets ; but in reality, under normal conditions, this is not the case, as is proved beyond doubt by the following:

1. The accurate experiments of Hellriegel, which demonstrated that the lack of phosphoric acid diminished the amount of the crop, but never the percentage of sugar in the beets.
2. Numerous field experiments.

Thus, for instance, at Lauchstädt the percentage of sugar was as follows :

	Percentage of sugar in the beets
Average of 11 years without phosphoric acid	17.60
Average of 11 years with phosphoric acid	17.58

When the beets were not harvested too early, those manured with phosphoric acid never showed a higher sugar content than those grown without phosphatic manures. Matters are somewhat different when the harvest is very early and on soils under less favourable climatic conditions where the beets mature too slowly.

Influence of potash manures. — With the old varieties of beets, potash manures always produced a depression in the sugar content, while with the new improved sorts, the contrary is the case, as numerous experiments testify(1).

The *ash content* of the new improved beets is not sensibly increased by heavy manuring. Thus the average ash content obtained from several experiments at Lauchstädt was the following:

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(1) *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Parts 56, 67, 81 and 193. (*Author's note*).

Manure per acre	Percentage of pure ash in dry matter
Without manure	1.89
4.8 cwt. nitrate, 0.8 cwt. phosphoric acid, farmyard manure	2.07
12 tons farmyard manure	1.98
12 tons farmyard manure, 3.2 cwt. nitrate, 0.8 cwt. phosphoric acid, 1 cwt. potash	2.39

A certain increase of ash due to the manure cannot be denied, but it is so small that it does not cause any great difficulty in working up the beets in the factories, especially as such heavy manuring as that given in the above experiments is rarely resorted to in practice. According to these investigations the dry matter of the new beet varieties contains only about 2 per cent. of pure ash, while up to the year 1880 the average percentage of ash in the dry matter of sugar beets was 3.84(1), or nearly twice as much as that contained in the new improved varieties. This is explained by the fact that for the production of our new varieties the beets richest in sugar have always been selected and such beets have always possessed a low ash content. Thus, without its being known, a low ash content has been inherited together with a high sugar content. Our present improved beets do not take less plant food from the soil and manure than the old ones did; on the contrary, they take up quite as much plant food, but store it up much less in the roots than in their strongly developed leaves.

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(1) Mentzel and von Lengerkes *Landw. Kalender*, Paul Parey. Berlin.
(*Author's note*).

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

202 - Government Crop Reports: Their Value, Scope and Preparation. — *U. S. Department of Agriculture, Bureau of Statistics, Circular 17.* Washington, November 1911.

The collection of agricultural statistics in the United States was first authorized by an Act passed May 15, 1862. In the following year a part of the appropriation for the Department of Agriculture was allotted for the work of collecting agricultural statistics; in 1865 $ 20 000 (£4113) were appropriated for this object. Since then the crop reporting service has been perfected and enlarged into the Bureau of Statistics; in the fiscal year 1912 the appropriations for this Bureau amounted to $ 232 000 (£47 721).

The data upon which the reports relating to agricultural conditions are based are obtained from State statistical agents and from voluntary correspondents.

Among the former there are 20 travelling agents, especially qualified by statistical training and practical knowledge of crops. They systematically travel over the districts assigned to them and note the development of each crop, keep in touch with best informed opinion and send in written and telegraphic reports monthly. There are besides 47 State statistical agents located in different States. Each receives the reports of correspondents in the different parts of the State, which he then coordinates and analyses in the light of his personal knowledge of conditions and prepares his report for his State to the department.

Independently of the above, there is, in each of the 2800 counties of agricultural importance in the United States, a principal county correspondent, who, with the aid of several assistants, prepares the reports for his county which he sends direct to Washington.

Further, the department receives reports direct from about 32 000 township correspondents located in the townships in which farming operations are extensively carried on.

Finally a large number of individual farmers and planters report on the results of their own individual farming operations during the year; valuable data are also secured from 30 000 mills and elevators.

With regard to cotton, the information from the foregoing sources is supplemented by that furnished by special cotton correspondents, and in addition enquiries in relation to acreage and yield per acre of cotton are addressed to the cotton ginners on the list of the Census Bureau.

From the time of planting up to that of harvesting, data are gathered and reports made as to the condition of each of the principal agricultural products; a normal condition of 100 is that of the plant where it gives promise of a good average crop provided it is not subjected to damaging influences. Condition reports, expressed in percentages of a normal, are coupled with a statement of the averages (usually ten-year averages) of similar reports at corresponding dates. At harvest time the yields per acre are ascertained; these being multiplied by the acreage figures already ascertained give the production figures for the year. Further, the causes of injury to the crops, the estimation of the value of the crops, the market prices, etc., are also frequently given.

The several employés send their reports separately and independently to the department at Washington.

In order to prevent any possible access to reports which relate to speculative crops, all of the reports from the State statistical agents as well as those from the special field agents are sent to the Secretary of Agriculture in specially prepared envelopes, which are delivered in sealed mail pouches. These pouches are opened only by the Secretary or Assistant Secretary, and the reports with seals unbroken are kept in a safe in the Secretary's office until the day when they are delivered to the statistician. The combination for opening the safe is known only to the Secretary and the Assistant Secretary of Agriculture. Reports from special field agents and State statistical agents residing at points more than 500 miles from Washington are sent by telegraph in cipher. The reports from the county and township correspondents and other voluntary agents are sent to the chief of the Bureau of statistics by mail in sealed envelopes.

A board composed of five members, which are changed every month, draws up the final crop estimates from the reports and telegrams sent in, for each State separately and for the whole of the United States. This board meets in the office of the statistician; they open the reports which till then have been kept sealed; each individual member computes independently his own estimate in a general report for each State. These reports are then compared and discussed and the final figures are decided upon.

Reports in relation to cotton are issued on the first or second day of each month, and reports relating to the principal farm crops and live stock on the seventh or eighth day of each month.

In order that these reports may be made available simultaneously throughout the entire United States they are handed at the same time on report days to all applicants and to the Western Union Telegraph Co. and the Postal Telegraph Cable Co., who have branch offices in the Department of Agriculture and who reserve their lines at the designated time for transmission to the exchanges and to the press. The same day cards containing the essential facts concerning the most important crops are mailed to the 77 000 post offices throughout the United States for public display.

Promptly after the issuing of the report, it is published in the Crop Reporter. An edition of over 165 000 copies is distributed throughout the whole country.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

203 - Agricultural Possibilities of Benadir, Italian Somaliland.

ONOR, ROMOLO. Appunti di agricoltura benadiriana — *Ministero delle Colonie, Direzione centrale degli Affari coloniali, Ufficio di studi coloniali Monografie e rapporti coloniali* No 1, pp. 62 + 15 figs Rome, January 1913

General considerations on the climate, rivers and soils of Benadir; description of experimental cultivations carried out by the writer at Caitoi and conclusions on the agricultural possibilities of the colony.

Climate. — The Somali year is divided into 4 periods : *Gu* (100 days : beginning of March to the beginning of June) ; *Hagái* (60 days : beginning of June to beginning of August) ; *Der* (100 days : beginning of August to end of November) ; *Gilál* (100 days : end of November to beginning of March).

The temperature is uniform throughout the year - at Caitoi in the hottest period the daily temperature ranged between 17° and 35° C. The regulating factor of plant life is essentially water. Gu and Der are the rainy seasons, the first being usually the period of most abundant rain ; during Hagái, sometimes, but not always, there are some slight irregular rains ; Gilál is the dry season, but not absolutely so as sometimes light rains occur in December. In 1911 the rainfall at Caitoi amounted to 330 millimetres (13 inches).

Rivers. — The Juba has one chief flood-time, from the beginning of October to the middle of December, and a smaller flood after April : In the first period in many districts it is possible to deviate water from it either directly or by raising it to a slight height, while in the second it would have to be raised considerably, except in the last 9 miles of its course up to which point the action of the tides is felt. The Uebi Scebeli behaves very similarly : its small flood however is much more abundant so that it also would allow of water being derived directly from it. In view of the very great quantity of silt carried by the river water it might perhaps be possible to improve certain districts by warping. Compared with Nile silt, the material carried down by the Uebi Scebeli is richer in organic matter and potash, not so rich in phosphoric acid and nitrogen, and very much poorer in calcium compounds. A sample taken at Caitoi gave the following results on analysis :

	Per thousand —		Per thousand —
Coarse particles	20	Calcium compounds	2.5
Fine earth (below 1 mm.)	980	Total P_2O_5	2.
Moisture	68.2	K_2O soluble in 25 % HCl . .	6.5
Organic matter (loss on ignition) .	140	Nitrogen	0.9

By the hydraulic method. Velocity of current 0,2 mm. per second.

gross sand . . .	750
clay	250

Soils. — In the districts which, it seems, will be colonized first, the soils are excellent and very deep. Some soils of Somaliland are salty, but not to such an extent as to cause serious inconvenience ; in fact at Caitoi cotton was not affected by it at all ; besides, in Somaliland those plants which characterize alkali lands are wanting.

In the analyses referred to here below, No. 1 is a sample taken in the experimental field of Caitoi at the depth of about one foot. No. 2 is a sample taken from the upper layer of the sides of a canal which showed abundant efflorescences.

	No. 1	
Dry soil at 105°C	94.5 per cent	96.2 per cent.
Soluble salts	5.5 »	3.6 »
Soluble sulphates	2.5 »	1.5 »
Chlorides and carbonates	Traces	

Experimental cultures. Cotton. — The varieties tested were : the native cotton which has a short and not very abundant lint, but is resistant to drought and to disease ; the Egyptian varieties (Afifi, Sakellaridi and Abassi) ; Upland and Caravonica.

The Egyptian cottons gave satisgactory results. Their period of vegetation lasted about 140 days. In plots that were never irrigated, cotton sowed in the middle of May succeeded perfectly with about 150 mm. (6 inches) of rain (up to October). In plots sown during the first ten days of June one irrigation before sowing and the rain that fell during July (55.75 mm. = 2.19 inches) were sufficient. The soil was worked to a depth of 10 inches, weeding was done four times. Though attacked by parasites Afifi yielded on 1.43 acres at the rate of 795 lbs. of ginned cotton per acre, an excellent crop.

Caravonica cotton attained exceptional dimensions and proved very resistant to drought

Both for Egyptian and for Upland cotton it was found that a plentiful supply of water at the moment of sowing and an abundant rain or irrigation about 45 days later were sufficient to ensure the crop. Consequently, without considering the rainfall, Upland cotton can be sown at the beginning of the Scebeli flood, from the end of August ; and at the rise of the Juba flood about the first days or the middle of October. The sowing of cotton of the Egyptian type is possible from the end of April to the beginning of June on the Scebeli, and on the Juba, wherever it will be found profitable to raise water for purposes of irrigation.

During the autumn floods of the two rivers (*Der*) the production of Egyptian cotton, using irrigation water, seems possible on the Scebeli and perhaps also in many districts of the Juba. Though, on account of the shorter duration of the flood of this river it is probable that Upland cotton, having a shorter period of vegetation, will prove more advantageous

Cotton at Caitoi has been found to be damaged by the following: The strong south-west monsoon in May and June, which produces curling and blackening of the edges of the young leaves; *Oxycarenis* (*hyalipennis*?); two varieties of *Disdercus*; the much more injurious *Heliothis* (*armiger or peltiger*?); *Gelechia gossypiella*, and some small green cicadas which collect on the lower surface of the leaves which they bore with their suckers causing them to become blistered and wrinkled; they do not do much damage to adult plants, but injure the young ones.

Tobacco. — The local production in Benadir is insignificant, and the importation from Zanzibar and Arabia amounted in 1911 to 214 952 lbs., worth £5974.

From his experiments the writer concludes that in Benadir two successive tobacco crops can be produced in the course of a year, the first being planted from the end of April to the beginning of June, the other from the beginning of September onwards, that is when water is available. Under normal conditions, the seedbeds give seedlings ready for setting out in about 40 days. The duration of vegetation from planting out to harvesting is 80 to 90 days. For the full development of the plants one irrigation before sowing, at the beginning of June, and 55.75 mm. (2.19 inches) of rainfall in the second half of June were sufficient for the first crop, and for the second one irrigation (September 8) before sowing and 134 mm. (5.27 in.) of rain towards the middle of November. By cutting the plants down to the ground immediately after the harvest a secondary crop is obtained which under favourable circumstances may amount to one-half of the principal crop. Eastern tobaccos attain a great development, producing large leaves with coarse ribs.

Maize. — Maize is the chief native crop of the region of the middle Scebeli. As with tobacco, two crops a year may be obtained, by sowing from the end of April to the beginning of June and from September onwards. In the writer's experiment the duration of vegetation was about 100 days for the spring varieties , and 80 days for the early varieties.

Sesamum. — It is cultivated to a great extent in the places where water stagnates for a length of time. At Caitoi it produced 8.4 cwt. of clean seed per acre.

Earthnuts. — They ripened in 170 days from the date of sowing and yielded 231 cwt. of dry nuts per acre.

Lucerne. — It succeeded very well and resisted prolonged drought, producing in three cuts 67 cwt. of hay per acre.

Besides the above, experiments have been commenced with *Manihot glaziovii*, kapok (*Eriodendron aufractuosum*), coconut palms, and several woody plants. As suitable for hedges the writer recommends *Euphorbia Lemaireana*, *Jatropha Curcas*, *Euphorbia Tirucalli*, *Parkinsonia aculeata*, *Cassia florida*, *Bixa Orellana*, and *Cajanus indicus*. For moist soils he advises growing bamboos, especially the large species *Dendrocalamus giganteus* and *D. strictus*.

204 - The Agricultural Development of Madagascar.

Madagascar et Dépendences. I. L'Agriculture et l'Elevage. II. La Sylviculture. — *Ministère des Colonies, Bulletin de l'Office Colonial*, Year 6, No. 61, pp. 7-10. Melun, January 1913.

European agricultural colonization is in full progress in Madagascar, where 252 790 acres were under cultivation in 1912, as against 105 270 in 1911. The agricultural production has increased from 52 950 to 110 700 tons. The increase is chiefly in crops of poor quality, which were little grown or not grown at all, in the preceding years, such as manioc, maize, kitchen garden produce, etc. Consequently the value of the crops does not increase in proportion to the area under cultivation, and is only £244 000 as against £222 100. The value of the agricultural production will, however, soon increase when the important plantations of vanilla, coffee, cacao, coconuts and ylang-ylang, which have developed much of late years, are in full bearing.

Coffee is one of the important cultivations and the plantations of this are extending most. It is calculated that the number of shrubs in the province of Mananjary alone will soon reach one million.

In 1912, the natives had 1 930 000 acres under cultivation, as against 1 660 500 in the preceding year. The Malagasy grow chiefly rice, but also much manioc and maize. On the volcanic soils of Vakinankaratra; barley and wheat are raised; at the present time clove trees are grown on 2700 acres, coconut palms on 2500 acres and coffee on 1100 acres; while 566 acres are under cotton and 882 acres under vanilla.

The live stock of the colony consists of 1968 horses and mules and 5 330 209 cattle; to the latter must be added the by no means inconsiderable number of wild cattle, which live in the desert zones of the west. The flock of ostriches belonging to the colony has now risen to more than 500 birds, while their number in 1910 was only 319. Crossing experiments have been attempted with ostriches from Abyssinia.

The Forestry Service of Madagascar has been occupied for several years in protecting the forests; these have suffered greatly from fires and from the native custom of sacrificing a wood to make "tavy" (rice plantations), as well as from intensive exploitation. The Administration has directed its efforts to the reconstitution of the forests which have been destroyed, by planting native trees, and has also turned its attention to the creation of uniform stands by acclimatizing rapidly-growing trees of general usage.

EDUCATION
AND EXPERIMENTATION IN
AGRICULTURE
AND FORESTRY

205 - A Retrospect of the Scholastic Year 1911-12 in the Agricultural and Forestry Schools and Colleges in Austria (1).

Rückblick auf das Schuljahr 1911-12 an den land- und forstwirtschaftlichen Lehranstalten in Oesterreich. — *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVI, Parts III and IV, pp. 239-265. Vienna, 1912.

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(1) This report does not include the Agricultural High Schools in Vienna, nor the Agricultural Institutes of the University. (*Ed.*).

The three agricultural Colleges of Austria were attended, during the scholastic year 1911-12, by 350 students ; of these 166 went to Tabor College, 72 to Tetschen-Liebwerd College, and 112 to Dublany College. At the Brewing Industry College in Vienna, 18 students were entered. The following table gives a review of the attendance of the Intermediate Ariculture Schools.

Intermediate Agricultural School in	Number of Students			
	I	II	III	Total
	Year			
Mödling	44	41	37	122
Chrudim	82	76	78	236
Kaaden	89	82	64	235
Raudnitz	91	73	44	208
Kloster-Hradisch	33	—	—	33
Neutitschein	32	28	22	82
Prerau	35	59	47	141
Oberhermsdorf	33	13	15	61
Czernichów	24	14	18	56
Total . . .	—	—	—	1174

A ministerial decree of May 21, 1912, made an alteration in the final examination of these intermediate schools; the subjects of the written examination being now chiefly agricultural practice, crop cultivation, and stock raising, while the oral examination includes also questions on implements and machinery. Formerly, the students of both the written and oral examinations included the four above-mentioned branches, and in addition, agricultural-chemical technology and land-improvement.

The Higher School for Fruit-growing and Wine-making at Klosterneuburg, and the Higher School for Fruit-growing and Horticulture at Eisgrub had during the last session 57 regular students and 16 occasional students, and 43 regular students and 2 occasional students respectively.

The number of students attending the Higher Forestry Schools were as follows:

	I	II	III	Total
	Year			
Brück a. d. Mur	15	11	14	40
Pisek (two years' course)	30	51	—	81
Reichstadt	40	29	25	94
Mährisch-Weisskirchen	28	28	17	73
Lemberg	45	39	26	110
Total	—	—	—	398

The number of students attending the 42 Austrian Agricultural Schools in the session 1911-12 was 1498. The Agricultural School for Women at Otterbach, opened in 1911, had 16 students during its first year.

In the winter half-year 1911-12, 3127 students in all attended the 88 Winter Agricultural Schools established in Austria ; that is an average of 35 to 36 students per school. During the official year , there were held 17 Summer Housekeeping Schools, attached to the winter-schools ; they were well attended.

The 10 Lower Forestry Schools had a total of 405 scholars. The report for the official year gives the following numbers for the 4 Dairy Schools : at Doren 11, at Friedland 23 for the winter course and 20 for the summer course, at Kremsier and Rzeszów 12 each and at the latter also 6 occasional students and 29 for practical work only.

In the 20 Agricultural Housekeeping Schools there weie 763 women students, while 323 attended the 17 Summer Housekeeping Courses.

Of the special agricultural schools during the session 1911-12, the 11 Schools for Fruit-growing and Wine-making had an attendance of 297 and the 8 Horticultural Schools of 162 students. The course on Alpine Economy at Grabnerhof was attended by 135 students during the calendar year 1911 ; while the Schools of Meadow Cultivation at Eger and Hohenmuth were each attended by 13 students during the official year 1911-12. The attendance at the School for the Cultivation of Hops and Vegetables at Saaz was 36, while 27 students attended the School for the Preparation of Flax at Saar. The Vegetable Cultivation School at Zábreh had 116 and the Hop-growing School at Brody, 6 students.

The courses of the Austrian Beekeeping School in Vienna were well attended. Of the 4 lower schools of instruction in the fermentation industry, the Brewery School at Mödling was closed owing to the small attendance. The other 3, the Brewery School in Prague and the Distilling Schools at Königliche Weinberge and Dublany, had 34, 27 and 20 students respectively.

206 - New Regulations Affecting the Study of Agriculture at the University of Cracow.

Neue Bestimmungen fur das Studium der Landwirtschaft an der k. k Universitat in Krakau. — *Land- und Forstwirtschaftliche Unterrichtszeitung* Year CXXVI, Parts III and IV, pp 161-168. Vienna, 1912.

Since 1890, the philosophical faculty of the University of Cracow has included a department for the study of agriculture. The hitherto provisional arrangements of the curriculum and examination subjects of this department have undergone changes in several important points as the result of a regulation passed by the Ministry of Education on May 12, 1912.

The most important provisions are the following: The study of agriculture, together with all Agricultural Institutions, collections and other aids to scientific education, forms an integral part of the Faculty of Philosophy. Only those persons who are admitted to the Philosophical Faculty on the strength of possessing a matriculation certificate can become regular students. Others are admitted to separate courses of lectures only as unattached students. The complete course, which is necessary in order to obtain a final certificate and the diploma, lasts for four years.

The subjects are divided into obligatory and optional. Every regular student is required to attend the lectures on the former subjects according to the prescribed scheme.

Every regular student is required, at the close of each session, to take an examination for the purpose of showing the progress he has made in agricultural knowledge, the successful passing of this test being the condition of his admission to the next annual course. In order to obtain the leaving certificate and diploma, the student is required to pass a final examination at the close of his fourth year of studies. The examinations are *viva voce* and held in public. In order to gain the diploma, the candidate must write a paper embodying his own observations; the choice of the subject is left to him to select from those which are represented by the agricultural courses. In the diploma it is stated that the student, having completed his agricultural course and passed the examinations, is sufficiently, well, very well, or excellently equipped with the theoretical knowledge necessary for the agricultural profession. Regular students who can give proofs of a four years course of University study can also take the degree of Doctor of Philosophy according to the regulations customary in that faculty. The required doctorate thesis may deal with agricultural subjects, and in this case will form part of the work required from the student in his agricultural examination.

207 - The Colonial Agricultural College at Tunis.

L'Ecole coloniale d'Agriculture de Tunis. — *Bulletin agricole de l'Algérie et de la Tunisie*, Year XVIII, No. 20, pp. 469-478. Algiers, October 15, 1912.

The Colonial Agricultural College at Tunis was founded in 1898 Since then it has been attended by upwards of 300 students; of these

97 are engaged in farming in Tunis and 32 in Algeria; 20 who have remained in the colony have taken up professions which are only indirectly connected with agriculture; 103 have returned to France and are occupied in farming; the others are in Morocco (7), in Indo China and Madagascar (17), in America, Egypt and Tripoli (8); lastly there are 16 in the military service and 9 have died.

The college farm disposes since last year, of a cultivable area of about 400 acres, of which 54 acres are under vines and 22 under olives. The property is provided, by means of underground wires, with electric power for the agricultural machines.

At present three experiment stations are connected with the college: for agriculture and agricultural botany, for the technique of farming and irrigation, and for agricultural parasitology. In order to keep the college in touch with the Central Station on the one hand and with the branch Stations and the farmers on the other, the director of the Central Station was appointed inspector of agriculture for the whole colony. In the year 1910-11, 688 cwt. of improved seed wheat which had proved the best for the region were distributed among 60 colonists and as many native farmers. Last year one half of the available area of the college farm was devoted to the production of the best seeds.

Numerous experiments have been conducted on various systems of farming, on the use of new implements for dry-farming, on methods of sowing, on application of manures, on the growing of several varieties of cotton, forage plants and vines, on the work of draught animals, on the use of windmills, on evaporation from the soil, irrigation, control of plant diseases and parasites, etc.

The curriculum is that of a college of agriculture. In the near future the successful passing of examinations at the end of a two-years course of instruction will confer the title of colonial agricultural engineer (Ingénieur colonial agricole).

The object of the foundation of this Institute was to give the future colonists of North Africa an opportunity of obtaining a thoroughly good agricultural education, both theoretical and practical, in the country itself in which they intended practising. For this reason the school receives, besides regular students, other pupils, the so-called "stagiaires agricoles." These are either intending colonists who have already gone through an agricultural college in France or who have already been engaged in practical farming in Europe and who wish to become acquainted, in the shortest time possible, with the special conditions of farming in a dry climate, before undertaking operations on their own account. The occasion to learn practically as volunteers on private estates but rarely occurs, as colonists accept only those young men whom they have previously known. On the property and experiment fields of the Institute the students can follow all the various operations and attend the lectures and practical exercices which interest them as well as the courses of Arabic.

By their intercourse with their fellow students, professors and colonists, they learn the habits and customs of the country; they can afterwards extend and complete their practical knowledge in any private farm and finally utilize it to advantage in their own farms.

AGRICULTURAL INSTITUTIONS

208 - The Swiss Dairy Association.

Der Schweizerische Milchwirtschaftliche Verein — *Schweizerische Milchzeitung*, Year 38, No. 103, pp. 1-2; Year 39, No. 1, pp. 1-2. Schaffhausen, December 24, 1912, and January 3, 1913.

The Swiss Dairy Association has hitherto chiefly been employed in improving dairy technique and the instruction of persons engaged in this industry.

The increasing importance of the Swiss Dairy Association — at the present time about 220 million gallons of milk are technically treated — the present condition of trade, and the efforts of the peasants for organization, have induced the Association to aim at the following points in future:

1) The improvement of instruction in dairy subjects.
2) Improvement of quality.
3) Stricter organisation.

As the first step to attaining these ends, and as a result of the experience of farmers in the matter of the Peasants' Secretariat, it was resolved that a Dairy Secretariat should be formed. The duties of this Secretariat were defined as follows:

1) The support of the Dairy Trade in commercial and legal questions.
2) The extending of the markets.
3) The promotion of literature on dairy subjects.
4) The establishment of an information bureau and returns of prices.

The necessary funds are to be obtained from the contributions of the different branch associations and from the grants of the league.

209 - The Agricultural Associations of the Cape Province.

Landwirtschaftliches Vereinswesen der Kapprovinz. Bericht des landwirtschaftlichen Sachverständigen beim Kaiserlichen Generalkonsulat in Kapstadt. — *Nachrichten für Handel, Industrie und Landwirtschaft*, No. 139, p. 5. Berlin, December 3, 1912.

In Cape Province there have been hitherto four large Agricultural Central Associations: the Cape Province Agricultural Union, the Cape Province Central Farmers' Association, the Western Province Board of Horticulture and the Eastern Province Board of Horticulture. Only the first of these was affiliated to the South African Agricultural Union, which covers the whole territory of the Union of South Africa.

On the occasion of last year's joint congress of the Cape Province Agricultural Union and the Western Province Board of Horticulture in East London, the long projected union of the four central associations was accomplished. The new society was entitled: "The Agricultural Association of the Province of the Cape of Good Hoope." It includes all the various local agricultural associations of the Cape Province.

The new association will appoint a central committee in which the interests of the different classes of agriculturists willl be represented. Affiliation to the South African Agricultural Union is contemplated.

AGRICULTURAL SHOWS AND CONGRESSES

210 - Central Agricultural Shows in France in 1913 (1).

Concours Centraux agricoles en France en 1913. — *Journal Officiel de la République Française*, Year XLV, No. 18, p. 534. Paris, January 19, 1913.

By a decree of Jnuary 15, 1913, the Minister of Agriculture has decided that the Central Agricultural Shows in 1913 will be held in the following places:

Antibes	March 10-16
Montauban	May 5-12
Epinal	May 19-25
Tarbes	May 26-June 1.
Nantes	May 26-June 1.
Chateauroux	June 2-8
Gap	June 2-8
Evreux	June 9-15

The programmes can be obtained from the Ministry of Agriculture and at the prefectures of the Departments concerned.

211 - General Show of Breeding Animals in Paris in June 1913 (2).

Concours général d'animaux reproducteurs à Paris, en juin 1913. — *Journal officiel de la République Francaise*, Year XLV, No. 18, p. 535. Paris, January 19, 1913.

By a decree of January 15, 1913, the Minister of Agriculture has decided that a general show of breeding cattle, sheep, pigs and sheep-dogs will be held in Paris on the Champs de Mars from Tuesday, June 17, to Sunday, June 22, 1913. The names of intending exhibitors must be sent in to the Ministry of Agriculture before May 5 at the latest. Forms for the use of exhibitors will be obtainable from the Ministry of Agriculture and from the Prefectures from March 15.

212 - Competitions organized by the Central Agricultural Association of Hérault, France, at Montpellier.

Concours organisés par la Société Centrale d'agriculture de l'Hérault. France. — *Bulletin de la Société des Viticulteurs de France, et d'Ampélographie*, Year XXV, No. 2, pp. 28-29. Paris, February 1913.

The Central Agricultural Society of Hérault is organizing, with a subvention of 5000 francs (about £200) from the Minister of Agriculture, the following competitions which will be held, the first four on April 26, 1913 and the last during the month of November.

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(1) See No. 100, *B.* Feb. 1913. (*Ed.*).

(2) See No. 1602, *B.* Dec. 1912. (*Ed.*).

I. Competition of sprayers.
  A. Large sprayers mounted on wheels and for pack mules.
  B. Knapsack sprayers:
    a) with pump
    b) with preliminary compression.
II. Competition of sulphurers and dusters.
  a) Large sulphurers and dusters.
  b) Knapsack and hand sulphurers and dusters.

III. Competition of large ploughing implements: two-share and three-share ploughs, etc.; hoes, scarifiers, harrows and surface pulverisers. These implements must work one or several rows of vines at a time. They may be harnessed to several horses.

IV. Competition of powders containing copper for the protection of vines against mildew.

V. A competition of vineyard ploughmen will be held in November.

For particulars apply to the "Société centrale d'agriculture de l'Hérault," 17 Rue Maguelonne, Montpellier.

213 - Exhibition of Machines with Combustion Motors for tilling the Soil, at Galanta, Hungary, August 1913.

SPORZON, PAL JUN. Az 1913, ebben rendezendo motoros szantó-és talajmivelógepek bemutatàsának tervezete. — *Köztelek*, Year XXIII, No. 6, p. 169. Budapest, January 22, 1913.

The Hungarian Agricultural Association is organizing, with the financial assistance of the Royal Ministry of Agriculture, the Exhibition, mentioned in the title, which will be held in August 1913, together with experiments. Entries must be made not later than March 31, 1913.

The object of this exhibition is to present home and foreign machines that have been tested and to discuss them systematically. The provisions adopted by the Committee are essentially the following:

The prescribed depth of the furrows will be 7 to 8¼ inches. Exceptions will be allowed. The exhibitor may provide his own fuel, but this must be handed over to the Committee for examination before being used. The Committee provides fuel on request. For the experiments to be made with each machine an area of at least 7.41 acres is provided.

Prof. Pál Sporzon, Director of the Machine Experiment Station at the Royal Hungarian Academy of Agriculture in Budapest has been charged by the Committee with the drawing up of the programme.

214 - General Agricultural Show at Tunis from April 18 to 27, 1913.

Concours général agricole à Tunis, du 18 au 27 avril 1913. — *La Revue des Colons de l'Afrique du Nord*, Year 2, No. 5, p. 79. Algiers, January 30, 1913.

This Show, during which motor-culture trials will be held, will take place at the same date as the Congress for the Advancement of Science.

215 - **Agricultural Show at Palestro, Dra-el-Mizan, Algeria, from May 22 to 25, 1913.**

Concours agricole à Palestro, Dra-el-Mizan, Algérie du 22 au 23 mai 1913. — *Office du Gouvernement général de l'Algérie*, Year XIX, No. 4, p. 6. Paris, February 15, 1913.

216 - **Agricultural Show and International Exhibition of Automobiles and of Industrial and Agricultural Motors to be held at Algiers in March-April 1913.**

Concours agricole et exposition internationale d'automobiles et de moteurs industriels et agricoles à Alger, en Mars-Avril 1913. — *Office du Gouvernement général de l'Algérie*, Year XIX, No. 4, p. 6. Paris, February 15, 1913.

On the 22nd of March an exhibition organised by the Automobile Club will be opened at Algiers. The exhibition will include amongst other objects: agricultural motors and implements; chemical products used in agriculture and manures; there will also be a show of breeding animals (April 16 to 20) a horse show; a cold storage exhibition; a horticultural exhibition; as well as a mechanical ploughing competition.

For information, apply to the Secretary of the Automobile Club d'Algérie: 23 Boulevard Carnot, Algiers.

217 - **Spanish-American Exhibition at Seville, Spain, from January 1 to October 31, 1916.**

Gaceta de Madrid, Year CCLI, Vol. IV, p. 880. Madrid, December 21, 1912.

A Royal Decree, dated December 20, 1912 postpones to January 1-October 31, 1916, the Spanish-American Exhibition which was to have been held in 1914.

218 - **Exhibitions and Congresses of Agriculture in London in June 1914.**

Tropical Life, Vol. IX, No. 1, p. 2. London, January 1913.

In June 1914 the following will be held in London: 1. The First International Exhibition of cotton, fibres, principal tropical produce and kindred matters. 2. The Fourth International Rubber Exhibition. 3. The International Congress of Tropical Agriculturists.

The first exhibition will include a section for palms and their products: fruits, kernels, oil, fibres, sugar, alcohol, etc., from coconut, oil palm (*Elaeis guineensis*), wild date (*Phoenix sylvestris*), palmyra (*Borassus Nipa*), nipa (*Nipa fruticans*), kittool (*Caryota urens*), buri (*Corypha data*), sugar palm (*Arenga* [*Sagerus*] *saccharifera*), sago palm (*Metroxylon Rumphii*), etc.

219 - **International Rubber Congress from September 7 to 12, 1914, and International Rubber Exhibition from September 8 to October 10, 1914, at Batavia, Java.**

Het Int. Rubber congress en Rubbertentoonstelling, Batavia 1914. — *Tijdschrift voor Nijverheid en Landbouw in Nederlandsch Indie: Uitgegeven voor de Nederlandsch-Indische Maatschappij van Nijverheid en Landbouw*, Vol. LXXXV, No. 6, pp. 371-377. Batavia, December 1911.

The exhibition will include the following sections: Botany, cultivation, collection, preparation and packing, parasites and other pests and means of control, economics (dwelling houses, hygiene, public worship and education), wild rubber and kindred substances, rubber substitutes, guttapercha and balata, commerce and statistics, literature, vulcanized rubber, methods of scientific investigation. — The Congress will include the following sections: botany and zoology, climate and soil, cultivation and harvesting, preparation, economy of production, synthetic rubber, commerce.

220 - Universal Exposition at San Francisco, by Authority of the United States Government, 1915, February 20 to December 4. Celebrating the Opening of the Panama Canal

In order to celebrate the opening of the Panama Canal, which will be officially inaugurated on January 1, 1915, the Federal Government of the United States announces a Universal Exhibition which will be held at San Francisco, California, from February 20 to December 4, 1915. The Exhibition will include the following sections: fine arts, education, social economy, liberal arts, various manufactures and industries, machinery, means of transport, agriculture, animal husbandry, horticulture, mining and metallurgy.

221 - Horticultural Congress in Paris, May 22, 1913.

Congrès d'Horticulture de 1913 à Paris, le 22 mai — *Journal de la Société nationale d'Horticulture de France*, Series 4, Vol. XIII, pp CVIII-CIX Paris, December 1912

The twenty-sixth congress organized by the National Horticultural Society of France will be held in Paris on Saturday, May 22, 1913, in the large hall of the Society, 84 Rue de Grenelle. All details May be obtained from the Office of the Society.

222 - The Sixth International Congress of the Dairy Industry, at Berne, Switzerland, in 1914.

VI^e^ Congrès International de l'Industrie Laitière à Berne, Suisse, en 1914 — *La Terre Vaudoise*, Year 5, No. 4, p 42 Lausanne, January 25, 1913.

The Universal Association of the Dairy Industry has entrusted the Congress of 1914 to Switzerland. The bureau of the Congress is established provisionally at the Liebefeld in Berne.

223 - International Dry-Farming Congress and Soil Products Exposition at Tulsa, Oklahoma, U. S. A., from October 22 to November 1, 1913.

CROPS AND CULTIVATION.

AGRICULTURAL METEOROLOGY

224 - A Method of Approximating Rainfall over Long Periods and Some Results of its Application.

DOUGLASS, A. E. Abstract from *Astronomical and Astrophysical Society of America.* — *Science*, New Series, Vol. XXXVII, No. 940, p. 33. Jan. 3, 1913.

It was found by a test extending over 43 years that the radial thickness of the rings of the yellow pine of northern Arizona gives a measure of the rainfall in that region with an average accuracy of over 70 per cent. By applying a simple formula, taking into account the conservation of moisture, the accuracy may be increased to about 75 per cent. By cross identification of rings between all the hundred trees examined, the accuracy of counting rings was greatly increased.

Five trees from the vicinity of Flagstaff Observatory were measured to the number of 400 rings, and two of these to 500. It was found that all the trees in that locality gave very similar records. A 21 year variation amouting to 16 per cent. of the mean is shown in 400 out of the 500 years recorded. A shorter variation amounting to 16 per cent. of the mean was found to have a period of 11.4 years. Its plot derived from 492 years shows two maxima which correspond in time with two maxima of rainfall in the 50 years of records on the southern California coast. These in turn match the major and minor maxima in the temperature of that region for the same period. The larger maximum of the latter occurs at the time of the sun-spot minimum as averaged for 125 years.

225 - Convenient Conversion Table for Frost Work.

MC ADIE, A. G. in *Monthly Weather Review*, Part I, Climatology, Climatological Summary for District 11; Vol. 40, No. 6, pp. 938-939. Washington, June 1912.

Orchard heaters, evaporators, and frost protectors of various forms have come into such widespread use that a convenient table for the quick conversion of heat units into power units, and vice versa, seems to be much needed.

It may be pointed out that the British thermal unit is the quantity of heat required to raise the temperature of 1 pound of pure water at maximum density (39.1° F.) 1° F. This is the unit most frequently used by engineers in the United States and Great Britain, although it is deemed desirable that the old English units and the Fahrenheit scale be used as little as possible, A British thermal unit is equal to 0.252 calorie and also equal to 777.5 foot-pounds, One therm will raise the temperature of 1 gram of water 1° C.; 1 000 therms equal 1 calorie, equal to 3.968 British thermal units.

In problems connected with the heat of water, it should be remembered that the total heat is the latent heat plus the sensible heat. The total heat required to evaporate water at a given temperatuee is 1 059.7+

0,428 T, where T is given temperature. This holds for temperatures between 32° F. and 212° F., or 0°C. and 100° C.

In changing to steam at 212° F. a pound of water at 212° F. absorbs 970.4 British thermal units and the total heat is therefore 1 150.4 British thermal units. This is starting from a temperature of 32° F. A pound of ice at 32° requires 142.4 British thermal units to change into water at 32° F. The latent heat of aqueous vapour mey be found from the following formula:

$$L_d = 1\,091.7 - 0.572\ t_d$$

Where L_d = latent heat, and t_d = temperature of water.

For convenience in frost work the following may be used:

1 kilowatt hour = 3 412.66 B. t. u.
1 H.P. = 746.3 watts.
1 H.P. hour = 2 544.6 B.t.u.
1 B.t.u. = 777.5 foot-pounds.
1 B.t.u. = 0.252 calories.
1 calorie = 1 000 therms.
1 calorie = 3.968 B.t.u.
1 calorie per kilogram = 1.8 B.t.u. per pound.
1 pound of air at 32° F. occupies about 12.4 cubic feet.
1 pound of water at 212° F. occupies 0.0161 cubic feet.
1 pound of steam at 212° F. occupies 26.14 cubic feet.
1 pound of water at 212° F. contains 181.8 B.t u.
1 pound of steam at 212° F. contains 1 150.4 B.t.u,
1 pound of ice requires 143.8 B.t.u. to change to water.
1 cubic foot of water at 212° F. weighs 59.84 pounds.
1 cubic foot of water at 62° F. weighs 62.2786 pounds.
1 cubic foot of steam at 212° F. weighs 0.03826 pound.
1 cubic foot of dry air at 32° F. weighs 568 grains.
1 cubic meter of dry air at 0° C. weighs 1 293.05 grams.
Specific heat of water, 1.000.
Specific heat of ice, 0.489.
Specific heat of water vapour, 0.453 at atmospheric temperatures.
Specific heat of air, 0.241.

Values given above are laboratory values, obtained by using distilled water. Ordinary drinking water is heavier than distilled water, because of matter in solution. Salt water is also heavier. It may also be remarked that the temperature of the freezing point in ordinary use, i. e., 32° F., or 0° C., may not hold for the freezing of water in plant life. W.N. Shaw instances one plant in which the freezing point is apparently 21° F., or-5° C. In other words, the change of water from the liquid to the solid state under natural conditions is somewhat different from the change as studied in a laboratory.

Some of the values given above differ slightly from those found in textbooks, but it is believed they are the most recent.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

226 - **Agricultural Study on Manganese.**

1. NOTTIN, P. Étude agrologique du manganese. — *Comptes Rendus de l'Académie des Sciences*, Vol. 155, No. 23, pp. 1167-1169. Paris, December 2, 1912.
2. ID. in *Annales de la Science Agronomique*, Year 30, No. 1, pp. 1-12. Paris, January 1913.

The writer proposes to study manganese systematically from an agricultural point of view, and to ascertain what becomes of the manganese introduced into the soil under the form of manganous salts.

Absorbent power of the soil — By using the method adopted for ammoniacal sals, the absorbent power of the soil towards the salts of manganese is easily demonstrated.

	Saline oxide of Manganese fixed by 50 grams of soil
Garden soil containing 85 % of lime	0.161 — 0.163 gram
» » » 19 » »	0.153 — 0.159
Fallow soil » 5 » » »	0.097 — 0.103

The various elements constituting the soil have not the same influence on this absorbent power:

1. *Silicious sand* has no action.

2. *Limestone* is strongly attacked in the cold by solutions of manganese sulphate or chloride; the whole of the acid remains in solution and the dissolved calcium replaces the manganese rendered insoluble, in the proportion of the atomic weights. In fact the ratio $\frac{\text{Precipitated manganese}}{\text{Dissolved calcium}}$ has been found to be 1.37; theoretically 1.375.

3. *Humus* does not play any part in the fixing of manganese. Peat and natural mould may, it is true, precipitate it owing to the calcium compounds they contain, but when these substances are freed from lime by means of an acid, they show no power of fixing.

4. *Natural clay*, taken in the form of loam, has sharply reacted on the solution of manganese sulphate, giving the figure 5.04 for the ratio $\frac{\text{Precipitated manganese}}{\text{Dissolved calcium}}$. Clay has thus an action of its own independent of the presence of lime.

As the soil possesses the power of fixing manganous salts, only small quantities of this element are to be found dissolved in the water of the soil. In fact the washing of 2 kilos of soil by 9 litres of water gave 17 milligrams of saline oxide of manganese, or 8.5 mg. of soluble saline manganese oxide per kilo. This soil nevertheless contained 1.45 grams of soluble saline oxide per kilo. Slightly aciduladed water dissolves a little more manganese: 0.037 to 0.088 grams of saline manganese oxide per kilo, according to the soils.

Consequently the drainage water contains also feeble proportions of manganese: 0.25 to 0.5 milligrams of saline oxide of manganese per litre. It is not enriched by the addition of sulphate of manganese to the soil. In fact the writer collected during a year the drainage water from two cylinders, both of them watered in the same way and each containing 10 kilos of the same soil; one of the two had received 0.5 gram of sulphate of manganese by means of superficial watering ; the other had not received any addition. Only the sulphuric acid passed into the drainage water without the corresponding manganese.

Summing up, arable soil renders manganese insoluble and retains it in the same way as it absorbs ammonia, potash and phosphoric acid.

Solution of the natural manganese of the soil in various reagents. — In regard to concentrated acids the figures obtained are so large in comparison with the quantities of manures usually employed that they do not present much interest from an agricultural point of view. On the contrary, the writer has found in the soils he examined such quantities of manganese soluble in acidulated water (1) as were sufficient to allow of an easy determination. It would be desirable, however, to know if the content of a soil in manganese soluble in acidulated water is connected with the requirements of this soil as to manganese manure. In order to solve this question a determination of the manganese soluble in weak reagents : water, acidulated water and ammonia, should be made in all those cultural experiments which are carried out on manganese manures.

227 - The Black Soils of the Oued R' Dom Valley in Marocco.

GIN, G. Les terres noires de la vallée de l'Oued R' Dom au Maroc. — *Comptes Rendus de l'Académie des Sciences de Paris,* Vol. 155, No. 23, pp. 1166-1167. Paris, December 2, 1912.

Three samples of arable soil taken from the very fertile valley of the Oued R' Dom in the neighbourhood of Dar Caïd Ben Ali in Morocco have been investigated by the writer and M. Mallet ; they have the following composition (per thousand) :

	I	II	III
Silica	296.3	316.2	164.1
Alumina	636.3	609.4	562.5
Oxide of iron	3.6	4.2	4.5
Phosphoric acid	1.2	1.4	1.3
Carbonic acid	5.4	5.8	5.8
Lime	5.8	6.1	6.3
Magnesia	2.0	3.1	3.0
Potash	4.1	4.7	4.3
Organic matter	24.6	26.6	30.1
Loss at 110°C	8.2	7.9	7.4
Combined water	10.2	9.2	8.4
	998.5	996.6	997.5
Organic nitrogen	1.52	1.72	1.04

The saturation capacity of these soils is 51.2 per cent. and their retention capacity is 34.3 per cent. Thus, one cubic foot can hold about

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(1) 5 cubic centimetres of nitric acid per litre, after cessation of effervescence. *Comité consultatif des Stations agronomiques et des laboratoires agricoles. Méthodes d'analyse des terres.* Paris, 1898. *(Ed.).*

2.14 gallons of water of imbibition and 1.25 gallons of water of combination, *i. e.* a total of 3.4 gallons.

Although the soil appears completely dry in summer, yet plants continue to grow in it during the hot months, so that the black soils lend themselves to dry-farming; in explanation of this the writer suggests that the plants must possess the power of absorbing the water of combination from trihydrated alumina, $Al_2 O_3, 3H_2O$, which remains in the clay after the disappearance of the water of imbibition.

The characteristic black colour of the soils of the Oued R' Dom, and in general of the Tirs of Morocco, is due to an amorphous humic substance resulting from the decomposition of vegetable matter, which has been transformed by gradual oxidation. It is partially soluble in caustic potash, giving a brown liquid.

The formation of the black matter is analogous to the process which results in peat and is promoted by the alternated wet and dry condition of the soil, the latter facilitating free access of air by the production of cracks.

228 - Irrigation Investigations at the Utah Experimental Station.

PERMANENT IMPROVEMENTS, DRAINAGE AND IRRIGATION

WIDTSOE, J. A., STEWART, R. and MERRILL, L. A. *Bulletin of the Utah Experimental Station*, Nos. 116, 117, 118, 119, 120, pp. 1-240. Logan, Utah, September 1912.

During the period 1902-1911 a large number of crops were grown on the Greenville experimental plots with various amounts of irrigation water, in order to investigate the influence of the water supply on the yields obtained. The average results for five of the chief crops are as follows:

Yield in lbs. per acre.

Crop	Irrigation water in inches								
	5	7 ½	10	15	25	30	35	50	55
Wheat.	4 969	5 545	5 684	6 279	6 672	—	7 229	7 999	—
Maize	—	10 757	12 762	13 092	13 856	14 606	—	—	12 637
Alfalfa.	—	9 094	6 942	8 369	8 606	8 133	—	9 949	—
Beetroot.	—	6 080	8 053	8 636	10 076	10 271	—	11 528	—
Potatoes	2 310	2 730	2 925	3 405	4 005	3 660	—	3 795	—

The yields increase with the amount of irrigation water applied, but with each additional increase in the irrigation water, the corresponding increase in yield diminishes, till a point is reached where further applications merely reduce the yields. This point is above 50 in. for wheat, alfalfa, beet and potatoes, but lies between 35 and 55 in. for maize. Further, when certain crops were grown without any irrigation at all they produced from 67 per cent. for potatoes to 85 per cent. for wheat of the yield obtained when 7 ½ in. of water were applied. As the total amount of irrigation water in any district is usually limited, the question of utilizing it to best advantage is of great importance and the above figures would indicate that far larger yields of produce could be obtained by spreading a given amount of water over a large area than by concentrating it on a smaller one.

Other experiments for investigating the number of irrigations and the time of year at which they should be applied showed that in a general way the best results were obtained when the applications of water were distributed so that the soil remained approximately equally moist throughout the growing season; with wheat and maize, the supply of moisture was specially important during the period of seed formation, *i. e.* at the period of transference of food material from the straw to the grain; with beet and potatoes, July and August were the two important months, and later applications did not appear to produce any material increase; with alfalfa the total yield was little affected whether the water was applied just before or just after each cutting. On the Greenville farm, where the annual rainfall is over 15 in., and where the soil is saturated at the time of planting, no advantage was obtained by irrigating before seed time; but applications of spring flood water (which would otherwise run to waste) after seed time but before the usual irrigation season gave some slight increase in yield, this increase being greater the later in the season the application could be delayed. Two methods of application were tried— flooding and furrowing — and the results suggest that cultivated crops do equally well with either of the methods, while non-cultivated crops are better when flooded.

In a certain number of the trials the crops were sampled, just before each irrigation, and subjected to analyses in order to ascertain the proportion of leaves, stalks, etc., in the plants, and the chemical composition of the different parts. The following conclusions were reached.

The plants grown with much water tend to be more leafy and, in the case of cereals, to have relatively lighter heads — the percentage of grain in the wheat crop varying from 33 per cent. where 50 in. of water was used to 44 per cent. with only 5 in.; these differences become evident early in the season.

The percentage of *water* in the parts of the plant above ground decreases with the amount of water applied, while in the underground parts (tubers of potatoes and roots of beets) it tends to remain constant.

The *ash* content on the other hand increases with the irrigation water in the aerial parts of the plant, and varies inversely with the irrigation water in the subterranean parts of the plant.

The *protein* content varies inversely with the irrigation water in all parts of the plant.

In sugar beets and potatoes the percentage of *carbohydrates* (starch + sugars) increases with the irrigation water.

Lastly, the protein content was also estimated in the wheat crops where the distribution of equal amounts of irrigation water was varied, and the results show that when the greater part of the water is applied early in the season the percentage of protein is highest, and the more irregular the applications the higher this value appears to be.

229 - Experiments with Butz' Drains in the Peat Moor near Bernau on the Chiem See.

HARTUNG, M. Versuche mit Butz'scher Drainage (1) im Hochmoore bei Bernau am Chiemsee. — *Der Kulturtechniker*, Year XVI, No. 1, pp. 51-53. Breslau, January 1, 1913.

For the drainage of the Lake Chiem moor, Butz' new drainage process was used.

Herr Butz selected as field of his operations an area of peat moor which the Bavarian Institute of Moor Culture is cultivating at present. The depth of the peat bed reaches 18 feet. In the year 1911 about 13.8 acres of this moor were drained by means of narrow ditches about 3 feet average depth. These ditches were deepened in 1912. In spite of this only gradual deepening of the ditches their sides showed a strong tendency to cave in. It became necessary to open each ditch to the necessary depth and to put in immediately the drain and to cover it partially. Under these unfortunate conditions a somewhat higher amount of labour was employed for the drainage than that stated by Herr Butz. From the tables which accompany the text it appears that to the rather high cost of this moor draining the constitution of the moor as to water content and to the presence of wood, roots, etc., as well as the depth of the drains, contributed more than the system employed.

TILLAGE AND METHODS OF CULTIVATION

230 - Use of Dynamite for breaking up Land (2). Experiments conducted at the Agricultural Station of Lausanne (Switzerland).

DUSSERRE, C. La culture du sol à la dynamite. — *Procès-Verbaux de la Société Vaudoise des Sciences Naturelles*, No. 3, 1913. (Séance du 22 Janvier). Lausanne, January 1913.

In order to bring under cultivation virgin soils which are not easily attacked by the plough, American farmers sometimes use dynamite. They make blast-holes 13 to 23 feet apart and 30 to 40 inches deep, at the bottom of which they place dynamite cartridges containing 15 to 20 per cent. of nitroglycerine and weighing 5 to 8 3/4 ounces ; the holes are then filled with sand or clay, and well rammed. Each cartridge is provided with a fulminate cap and a match, an extremity of which protrudes a few inches above the soil. The cartridges are fired either by lighting the matches direct or by electricity. The explosion raises the ground, and breaks it up sufficiently to allow it to be easily ploughed. The cost of the operation is reckoned at £2 8*s* to £4 per acre.

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(1) Butz' system consists in the use of long wooden drains, having a square cross section, made of boards 0.4 to 0.8 inch thick, 2 to 8 in. broad and usually 13 feet long, nailed together and forming one long drain. (*Ed.*).

(2) See : CORNELIO GUERCI, Esperimenti nel dissodamento del terreno col mezzo della dinamite. — *Annali della R. Accademia di Agricoltura di Torino*, Vol. XIII, p. 37. Turin, 1880. — See also No. 2529, *B.* Aug.-Sept.-Oct., 1911 ; No. 3135, *B.* Nov.-Dec. 1911; No. 671, *B.* April 1912: No. 777; *B.* May 1912; No. 1398, *B.* Oct. 1912. (*Ed.*)

In order to form an opinion on the utility of this process, new to Switzerland, the Federal Institution of Agricultural Chemistry at Lausanne made, in November 1912, some experiments in the property of Colonel Ribordy at Planisse sur Saint Léonard (Valais). Some land intended for a plantation of fruit-trees was prepared by exploding at the spot to be occupied by each tree a cartridge of about 8 $^3/_4$ oz. of " gamsite " a safety explosive manufactured by the Gamsen (Valais) works, and containing about 24 per cent. of nitro-glycerine. This operation prepares the ground very well for planting young trees. The explosion of the charge placed at a depth of 40 inches, raises and breaks up a volume of from 35 to 52 cubic feet of earth in the form of an inverted cone, the base of which measures on the surface of the soil about 6 ft. 6 in. The grassy sods were projected to a short distance. In spring all that will be required before planting will be to shovel out a hole large enough to accomodate the roots so that they may develop freely without encountering resistance. The whole operation costs about 7*d* per tree, while the holes for planting made by hand labour often cost more and their volume does not exceed 17 cub. feet. Experience has proved that trees planted in soil prepared by dynamite developed more rapidly and came into bearing earlier than those planted in the usual manner.

It appears also that dynamite might be advantageously used for preparing land for plants possessing deep roots, such as the vine, especially when the subsoil is hard and compact. With holes at 16 ½ ft. apart and cartridges containing 5 oz. to 8 $^3/_4$ oz. of explosive (which seems sufficient), the cost of breaking up the land does not exceed £8 per acre, while the same work done by hand to a depth of 2 feet costs about four times as much.

Among other experiments one was made in a moist soil on which it was intended, after drainage, to grow lucerne. The resistance of the water did not allow of useful work being done; the energy of the explosive was spent in projecting the soil to a great height, making holes measuring about 17 cub. ft. This method does not therefore seem advisable for soils possessing a water table not far from the surface.

By using the so-called safety explosives (cheddite, gamsite, westphalite, telsite, etc.) prepared by various factories, the soil can be worked without incurring any serious danger, provided of course that elementary precautions be taken to guard against accidents.

MANURES AND MANURING

231 - The Composition of Russian and Foreign Fish Manures and of other Manures of Marine Origin.

KOSSOWITSCH, P. S. and KOTOLOW, G. I. K voprosu o sostavie russkich o inostrannyeh rybnyeh tukov i drughich udobrenij «mosrkago» proiskhoydenia. — *Jurnal Opatnoi Agronomii* (Russisches Journal für experimentelle Landwirtschaft), Year XIII, Part 6, pp. 801-814 (815-816). St. Petersburg, 1912.

This article gives useful information regarding the composition of Russian herring manure, comparing it with different fish manures and similar manures from other countries. For the latter purpose, the results of numerous analyses of the most various manures of " marine " origin have been collected, many of the data having been taken from the agricultural press.

The following table gives the composition of three kinds of Russian herring guano, which were analysed at the St. Petersburg Agricultural Laboratory of the Chief Office of the Land and Agricultural Organisation Society.

At the end of the summary, the writers come to the following conclusions. All fish manures can be divided into two groups ; the first includes those which are relatively poor in phosphoric acid (not more than 7 per cent), while those of the second group have a high phosphoric acid content (12 to 15 per cent.). The Russian herring manures examined in the abovementioned laboratory belong to the first class. A third class is formed by manures made of lower marine organisms, and characterised by a low percentage of phosphoric acid (0.6 to 1.6; in the case of *Fucus* only 0.1 per cent.). These various manures contain very different amounts of nitrogen. In the first class, the nitrogen content varies from 6 to 13 per cent.; the second lot are more even, ranging from 6 to 9 per cent. ; the representatives of the third class have from 1.4 to 5.3 per cent. of nitrogen and the *Fucus* seaweed only 0.35. All the manures mentioned, except the American fish-guano, are extraordinarily deficient in potash, averaging only about 1 per cent. Data respecting the fat content are only available in the case of the first and third classes ; in the former, this varies from 4 per cent. to 18 per cent.; Russian herring guanos from Sakhalin are almost the poorest in fat, while the Vladivostok guanos occupy a middle position from this point of view. The fat content in the third group varies from 0.7 per cent. to 5 per cent.

The Composition of Russian Herring Manures.

	In 100 parts of dried substance:													
								Extracted from the ash by 10 % HCl						
	Hygroscopic water	Loss on ignition	Ash	Total nitrogen	Total phosphorus	Total fat	Ash insoluble in HCl	Silica	Clay	Oxide of iron	Lime	Magnesia	Potash	Soda
Manure from Sakhalin: I . .	9.796	81.656	18.344	10.280	6.748	5.808	1.816	0.129	—	—	6.208	0.551	1.029	1.530
Manure from Sakhalin: II . .	10.630	88.336	11.664	10.918	4.268	6.240	1.064	0.211	—	—	2.915	0.430	1.032	1.498
Manure from Vladivostock .	6.660	86.800	13.200	11.770	4.850 (1)	11.612	—	—	0.12 (2)	0.13 (2)	4.46 (2)	0.33 (2)	0.84 (2)	0.63 (2)

(1) Extracted with sulphuric acid + nitric acid.
(2) Extracted from the ash by nitric acid.

232 - Agricultural Value of Carbonate of Lime recovered from Causticising Plant.

HENDRICK, K. J. in *British Association for the Advancement of Science.* Dundee 1912. Section M. (Agriculture) *m* 17. London.

The writer states that great quantities of precipitated carbonate of lime are obtained as a by-product from causticising plant, and that in many parts this precipitated chalk is thrown on the dump-heap as a waste product, while it may be that the surrounding fields are hungering for carbonate of lime.

This waste product as obtained from the dump-heap contains about 50 per cent. of moisture, and is a somewhat tenaceous substance. The dry matter is mainly carbonate of lime; small quantities of other substances are present, which vary considerably according to the process used. A little silicate of lime is always present, and there is generally some organic matter. The material is always alkaline; the alkalinity is in some cases due to calcium hydrate, and in others to sodium hydrate and carbonate; it varies greatly; in certain samples an alkalinity due tc soda, and corresponding to 6 per cent. of sodium hydrate was found, in other samples the alkalinity was under 1 per cent.

Till now little use has been made of this substance; one reason for this is that in the wet state it is difficult to spread; it is however easily dried, when it forms a fine powder, which is easily distributed.

A number of field experiments have been carried out with this carbonate of lime, in which it has been compared with other forms of lime, such as burnt lime and ground limestone. The experiments have all been made on land deficient in lime and very subject to finger-and-toe in turnips. So for as they have gone they show that whether the results are measured by increase of crop or by diminution of finger-and-toe disease, the precipitated carbonate of lime does at least as well as any other form of lime. It has, on the whole, acted better than an equal quantity of commercial ground limestone, as it is very much finer, and is therefore more thoroughly mixed with the soil. It was found that the presence of a small percentage of sodium hydrate and carbonate had no prejudicial effect on its action.

233 - The Secondary Effects of Phonolite.

KASERER, H. Ueber Nebenwirkungen des Phonoliths. — Aus dem Institut für landw. Pflanzenproduktionslehre und der Versuchswirtschaft der k. k. Hochschule für Bodenkultur in Wien. — *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien*, Vol. I, Part 3, pp. 271-284. Vienna, January 15, 1913.

One of the questions raised about the manurial value of phonolite is that of the eventual secondary effects on the utilization of the nitrogen in the soil, several opinions being current. The writer proposed studying the effect of phonolite on the utilisation of the nitrogen of the soil and of nitrogen in loams and sandy soils.

Arrangement and results of pct experiments.

Manure	Pots nos.	Barley								Foiage maize			
		Number of		Crop in grams		Grain p. cent.		Straw p. cent.		Number of plants	Crop, grams	Dry Matter per cent.	Nitrogen per cent.
		Plants	Stems	Grain	Straw	Dry Matter	Nitrogen	Dry Matter	Nitrogen				
						Sandy soils.							
PN	17,24,31	18	89	52.5	106.2	89.96	2.656	91.08	1.542	29	122.5	90.30	0.920
PNK . . .	18,25,32	18	96	55.9	114.4	89.44	2.637	91.80	1.409	30	111.8	91.92	0.990
PNφ . . .	19,26,33	18	78	48.4	101.2	89.28	2 639	91.72	1.636	30	102.6	92.12	0.907
PNKφ . .	20,27,34	18	82	47.9	100.4	89.58	2.510	92.36	1.532	30	108.2	92.14	0.898
PK	21,28,35	18	63	61.0	77.0	89.28	2.063	91.94	0.725	30	82.9	90.76	0 994
Pφ	22,29,36	18	59	55.3	74.9	89.22	2.048	92.00	0.822	29	87.0	91.86	0.975
PKφ . . .	23,30,37	18	70	63.7	81.3	89.34	2.031	91.72	0.672	30	86.3	91.24	0.954
						Loamy soils.							
—	38,47,56,65	24	75	58.9	87.5	89.52	1.883	92.40	0.457	37	59.4	90.70	0.884
P	39,48,47,66	24	69	62.6	84.0	89.56	1.815	92.24	9.443	38	49.5	91.12	0.983
PN	40,49,58,67	24	144	109.3	150.8	89.62	2.075	94.36	0.747	39	75.8	91.34	0.847
PNK . . .	41,50,59,68	24	145	117.8	164.7	89.44	1.999	91.98	0.716	37	69.9	91.06	0.881
PNφ . . .	42,51,60,69	24	139	91.5	154.8	89.86	2.201	92.04	1.129	39	76.6	91.56	0.896
PNKφ . .	43,52,61,70	24	140	116.9	164.2	89.38	2.024	93.72	0.665	39	61.1	91.60	0.895
PK	44,53,62,71	24	78	70.4	89.1	89.46	1.786	91.92	0.425	40	45.5	91.46	0.971
Pφ	45,54,63,72	24	82	61.2	94.2	89.34	1.834	91.14	0.440	38	51.3	91.20	0.950
PKφ . . .	46,55,64,73	24	76	65,1	87.9	89.64	1.753	94.62	0.469	38	48.5	91.50	0.940

In each pot 9 500 grams of soil were placed, the same weight being used for the sandy and the loamy soils. The former contained 8.42 per cent. of moisture, the latter 17.98 and was besides very rich in phosphoric acid.

P represents 0.5 gram of phosphorus pentoxide as monocalcium phosphate ; N = 0.6 gr. of nitrogen as calcium nitrate ; K = 1 gr. of potash as potassium chloride ; φ = 10.8 gr. of phonolite containing 9.28 per cent. of potash.

The results given in the annexed table do not seem to show that the application of phonolite exerted any useful action, save by the direct action of the potash, and in the case of the very poor sandy soil not manured with nitrate, but not in the sense of favouring the fixation of nitrogen ; in all the other cases, as a secondary effect, a diminution of yield was observed. In the case of simultaneous application of phonolite and nitrate of lime, the lower yield was accompanied by a lesser utilization of the nitric nitrogen : hence the opinion that phonolite acts as a denitrifying agent.

Summing up, it appears that there is no evidence that phonolite has a favourable secondary action ; the contrary rather seems to be the case. Consequently, apart from its value as a potash manure, it should never be employed excepting where its favourable secondary effects have been ascertained by means of careful experiments. Lastly, it is to be noted that these results disagree with those obtained by Prof. Hiltner, but agree with those of Prof. Pfeiffer and his collaborators.

234 - New Experiments on the Fertilizing Property of Sulphur.

SABASCHNIKOFF, V. V. Novje Opjtj s Fiernjm ziretom, 'kak oudsbrenjem. — *Jurnal Opetnoj Agronomij* (Russisches Journal fur experimentelle Landwirtschaft), Year XIII, Part 6, pp. 817-821 (821-822) + 1 plate. St. Petersburg, 1912.

The writer has made experiments (1) to ascertain whether flowers of sulphur have any effect on the growth of barley and rye. The experiments were carried out in the experiment garden of the Agricultural Institute at Nancy in a very rich clay soil after beets.

The soil analyses gave an average sulphuric acid content of 0.082 per cent. It is well known that most soils are poor in sulphuric acid, the amount varying, according to Hart and Petersen, from 0.033 per cent to 0.14 per cent., almost always remaining below 0.10 per cent. The sulphuric acid present in the experimental soil was thus an average amount.

The sulphur was applied before sowing (at about 1/3 oz. per sq. yd., or 90 lbs. per acre). The sowing was done on February 25, 1912.

The favourable effect of the sulphur showed itself from the beginning in the stronger growth and brighter green of the plants on the treated plots. This result persisted till the crops ripened.

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(1) See No. 780, *B.* May 1912, and No. 1397, *B.* October 1912. (*Ed.*).

The crop reaped on July 26 was weighed (grain and straw together). The average weight per plot of 2 sq. m. (2.4 sq. yds.) was as follows:

	Barley — lbs.	Rye — lbs.
Without sulphur	13.0	9.5
With sulphur	16.5	12.75
Increase due to sulphur	3.5	3.25

These figures clearly show the good effect of sulphur upon the cereals used for the experiment.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

235 - The Effect of the Concentration of Nutritive Solutions upon their Absorption by Plants.

POUGET, I. and SCHUSCHAK, D. Vlijanie conzentrazij pitatelmjeh rastorov na ich pog lostschenie rastenìem. — *Jurnal Opcĭnoi Agronomii*, Year XIII, Part 6, pp. 823-828 (828-829) + 3 figs. St. Petersburg, 1912.

The writers have investigated in the laboratory for Applied Chemistry of the University of Algiers the absorption by wheat plants 2 to 4 weeks old of various nutritive substances from solutions of different degrees of concentration and from aqueous soil extracts.

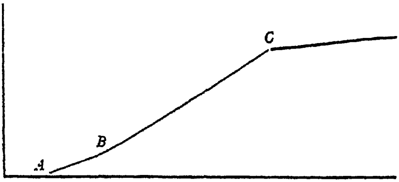
Their results, using nitrate nitrogen, were as follows:

I

Concentration of the solution in mg. nitrogen per litre	0.5	1	2	4	8	16	32	64	100	200
Nitrogen absorbed, mg.	0.04	0.11	0.2	0.41	0.8	1.61	3.2	6	8.5	15

II

Concentration at the beginning, mg. nitrogen per litre	0	0.5	1.0	2.0	4.0	8.0
Average concentration during the experiment, mg. per litre	0	0.43	0.87	1.65	2.76	5.1
Absorbed nitrogen, mg.	0	3.29	6.82	11.7	13.7	20.1
Plant weight (dried at 100° C.) mg.	0.364	0.399	0.418	0.433	0.414	0.428
Increase over plants grown without nitrogen	0	0.035	0.054	0.069	0.060	0.064



The writers summarize the total results of their experiments as follows.

Where the concentration of the solution was very low (under 0.1 mg. per litre for phosphoric acid) no absorption was observed; on the contrary, the plants excreted from their roots the nutritive matter which they had before absorbed in the organic or inorganic form (point A of the curve). With the rise in concentration, the absorption is at first more rapid than the increase in concentration, till it reaches a certain point (B on the curve); beyond this point the absorption is strictly in proportion to the concentration of the solution; subsequently a point is reached (C on curve) when this ratio is disturbed, and the absorption increases more slowly than the concentration rises; eventually, the absorption ceases to depend upon the concentration (the absorption of the nutritive substance from the solution is then regulated by its assimilation by the plant). It is clear that the positions of the points A, B and C upon the absorption curve depend upon the condition of the plants, their stage of growth, and upon external conditions (light, warmth, etc.). It should also be noted that with solutions of very low concentration, the nutritive substance is absorbed much more rapidly than water.

These results show that soil solutions, in spite of their great want of concentration, play a every important part in crop development, as has been shown by Schlösing (the younger) and the writers in the case of the assimilation of phosphoric acid.

If the concentration of the soil solution is higher, as regards elements necessary for the nutrition of the plant, than the limit of concentration C (see the above curve), the yield of the crop will depend upon other factors (climatic, biological, etc.).

If on the other hand a minimum quantity of one, or all, the nutritive substances is present and the concentration falls below the limit C, the absorption of the substance in question and therefore the yield of the crop will be strictly dependent upon this concentration.

236 - Transpiration in Plants in Relation to Atmospheric Humidity.

MONTGOMERY, E. G. and KIESSELBACH, T. A. *Bulletin of the Agricultural Experiment Station of Nebraska*, Vol. XXIV, Article VI, (*Bull.* 128), pp. 4-6. Lincoln, Nebraska, 1912.

The following experiment is a continuation of the work already reported by the writers (1). The same apparatus was used as before, but the cans containing the maize plants were put into two greenhouses, in one of which the air was kept as moist as possible, whilst the other was left open and therefore had a comparatively dry atmosphere. A record of temperature and relative humidity was kept, and the effect of the different conditions on the plants is shown in the following table:

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(1) 24th *Annual Report of the Agricultural Experiment Station of Nebraska*, pp. 91-107. See also No. 1647, *B.* June 1911. (*Ed.*).

	Dry greenhouse —	Humid greenhouse	Ratio: Humid to Dry
Mean temperature	85° *F*	81° *F*.	—
Total dry weight of plants in grams	670	862	—
Total water used in kilogr.	278	184	—
Gr. of water per gr. of dry weight	340	191	1 : 0.56
Water evaporated from 36 sq. in. of free water surface (grams) . . .	3 891	2 187	1 : 0.56

The plants in the humid greenhouse attained the greatest dry weight, though the total leaf area was approximately the same in both cases; but the amount of water used per unit weight of dry matter was almost twice as great in the dry as in the humid house and this ratio was reproduced exactly by a comparison of free water surfaces exposed in the two houses.

237 - The Wilting Coefficient for Plants in Alkali Soils.

KEARNEY, T. H. *United States Department of Agriculture, Bureau of Plant Industry, Circular* No. 109, pp. 17-25: Washington, January 1913.

The writer used the same apparatus as Briggs and Sehantz in their experiments on the wilting coefficient of plants (1). Wheat seedlings were employed and a range of soils containing from 0.183 to 0.759 of water-soluble material per 100 dry soil. The results show that where plant growth is not entirely prohibited by excess of alkaline salts, the presence of the salts does not prevent the plant from drying out the soil to the same extent as when it is in a normal condition.

238 - Comparative Transpiration Experiments with Awned and Awnless Barley.

SCHULZE, G. W. Vergleichende Transpirationsversuche zwischen begrannter und grannenloser Gerste. — Aus dem Institut für Pflanzenzüchtung der k. k. Hochschule für Bodenkultur in Wien. — *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien*, Vol. I, Part 3, pp. 285-308 + 3 plates. Vienna, January 15, 1913.

The chief result of the transpiration experiments is the confirmation of the opinion held by v. Proskowetz and other investigators that naturally awnless varieties of barley have in comparison with the awned barleys an extraordinarily low energy of transpiration: under otherwise normal conditions, this reaches a maximum of only one-sixth of that of awned Hanna barley.

Further, in awnless barleys a continuous increase of transpiration was shown to accompany the development of the ears. In these experiments the maximum was reached at the milky stage.

The observation made during all the stages of development that the artificial removal of the awns from the ears did not place them on the same level with the awnless barleys in respect to transpiration, was attributed, by means of special experiments, for the most part to the increased loss of water due to the wounds.

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(1) See No. 903, *B* June 1912. (*Ed.*)

The transpiration experiments made between *Hordeum vulgare* var. *trifurcatum* (hooded barley) and awnless barley gave, at the milky stage, a 40 per cent. lower transpiration for the awnless barley.

Experiments made with awned Hanna barley and the same artificially deprived of its awns, together with awnless barley under diffused light and in direct sunlight gave the following result: under direct sunlight awnless barley, in comparison with artificially awnless barley and especially with awned barley, transpired relatively more than under diffused light. The percentage figures obtained for the increase of transpiration at the milky stage under direct sunlight stood in the ratio of 44 : 38 : 19.

239 - Results of Selection on Wheat Yields in Nebraska.

SELECTION

MONTGOMERY, E. G. Wheat Breeding Experiments. — *Bulletin of the Agricultural Experiment Station of Nebraska*, No 125, pp. 1-16 Lincoln, Nebraska, March 1912.

In 1902 the systematic improvement of Turkey Red Wheat was commenced at the Nebraska Experiment Station, this wheat having proved specially adapted to withstand the cold dry winters of that region.

The method of selection from single ears was adopted, and during the four years 1907-10, 26 pure strains thus obtained were tested in field plots. The average yields varied from 28.8 to 40.7 bushels per acre, whilst the control plots sown with the original stock of Turkey Red yielded 35.1 bushels per acre. The following year, seed of three of the most promising strains was distributed amongst farmers of the district. In each case the test plot was eight acres in extent and formed part of a larger field, so that the returns from selected and unselected seed could be compared. In the 21 tests thus made the local Turkey Red yielded on an average 21.9 bushels per acre, whilst the improved grain yielded 25.9 bushels per acre, showing a net gain of 4 bushels per acre.

The experiments are being continued and a new strain is now ready for distribution which appeers to be superior to any other so far tested, especially with regard to colour and quality.

240 - Asparagus Breeding for Rust Resistance.

NORTON, J. B. *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 263, 60 pp. Washington, January 1913.

The Massachusetts Asparagus Growers' Association was organised in 1900 to produce by breeding a variety of asparagus resistant to the rust *Puccinia Asparagi*. The cooperation of the United States Department of Agriculture was obtained, and breeding experiments were begun in 1908; they were conducted partly in greenhouses at Washington, D. C., and partly in the field at Concord, Mass. A large number of varieties both from America and Europe were planted, and in the autumn of 1908 the fields were inspected and all specially resistant plants marked, the work being repeated in 1909 and 1910.

A number of correlation studies were made between the various vegetative characters of the plants, so that as the work proceeds, the useless varieties can be recognised at an early stage and discarded. Moreover the tables show that the asparagus plant has a stable and permanent individuality and is well adapted to breeding work.

Further studies show that there is little relation between vigour, as measured by growth, and rust resistance, but that the latter quality is transmitted by resistant parents to their offspring. Two such parents, a male and a female, have given excellent results, and their progeny will be produced in large quantities for distribution.

CEREAL AND PULSE CROPS

241 - How Thickly Should Seed be sown on Mountain Farms?

WILLNER, M. Wie stark soll der Gebirgsbauer säen? — *Zentralblatt für Landwirtschaft* Year 93, No. 2, pp. 14-18. Brünn, January 16, 1913.

In 1911 and 1912, the writer made experiments on the two farms of Lessonitz and Watzanowitz in the south-west mountainous district of Moravia as to the best amount of cereal seed to sow; the results have been given by him in a series of tables. The estates are situated at 1300 to 2000 feet above sea-level; the soil is chiefly a somewhat sandy loam or loamy sand. Its content in nutritive matter is: nitrogen, 0.13 per cent.; phosphoric acid, 0.07 per cent.; potash, 0.35 per cent.; and lime, 0.3 per cent.; thus, except for the deficiency in phosphoric acid, it may be considered sufficiently rich to ensure good crops in favourable seasons.

I. *Wheat.* — In the year of drought 1911, the highest total and net production was obtained on both farms by sowing the largest amount of seed. At Lessonitz 225 lbs. of seed produced 32.2 bushels of grain and 36 cwt. of straw per acre; at Watzanowitz, with 170 lbs. of seed, the yield was 34.4 bushels of grain and 36 3/4 cwt. of straw. At Lessonitz, Strube's Schlanstedter Squarehead was grown and at Watzanowitz, Zborowitzer Squarehead.

In the wet year 1912, the maximum production was also obtained at Lessonitz by sowing the largest amount of seed, 202 lbs. per acre, *viz.* 43.1 bushels gross yield per acre, which corresponds (subtracting the seed) to 39.7 bushels net yield. The net yield of the next plot, which was sown with 170 lbs. of seed, was only a little less, *viz.* 39.1 bushels. At Watzanowitz, the experiments of 1912 gave less concordant results: the maximum yield of grain (49.6 bu.) was obtained by sowing 103 lbs. of seed; after this come the net yields of 48.0 and 44.6 bushels, resulting respectively from the sowing of 200 and 180 lbs. of seed. On both farms Strubes Schlanstedter Squarehead was the variety grown.

II. *Rye* — The variety sown on both farms was Von Lochow's Petkuser. In 1911, the highest yield on both farms was obtained with the largest quantity of seed (at Lessonitz 196 lbs., at Watzanowitz 160 lbs.); but at Lessonitz nearly the same net yield of grain was obtained with 160 lbs. as with 196 lbs. (28.7 and 28.9 bushels respectively). The yield increased with the increase of the seed sown also in the wet season of 1912, but the maximum crop was obtained with 160 to 196 lbs. of seed.

III. *Barley.* — In 1911, the barley (Melon) also yielded the maximum crop (36.0 bushels) when sown thickest (191 lbs.) But in 1912 the largest crop of Melon barley was obtained at Lessonitz from only

160 lbs. per acre. In the experiment at Watzanowitz (with Moravian barley) the yields obtained by sowing from 93 to 218 lbs. showed very slight differences.

IV. *Oats.* — In the experiment carried out in 1911 on both farms with Ligowo oats, the highest yields were obtained from the largest quantity of seed, *viz.* at Lessonitz 68.9 bushels from 160 lbs. and at Watzanowitz 55.8 bushels from 156 lbs. In 1912, the crops on both estates rose with the amount of seed sown. The largest yields of 54.4 bushels (Ligowo) and 78.5 bushels (Petkuser Yellow) were obtained by sowing from 160 to 180 lbs. of seed.

The writer considers that these experiments clearly show that, under the given conditions, in the case of rye, barley and oats the best crop is obtained with from 160 to 180 lbs. of seed per acre; for wheat, especially the Squarehead type, at least 180 lbs. must be sown to get the highest net yield.

242 – Noltch's Imperial Barley cultivated in Hungary.

RÓSZLER KÁROLY. Milyen árpát termeljen az alföldi gazda? — *Mezőgazdasági Szemle,* Year XXXI, No. 1, pp. 35-37. Budapest, January 1913.

The writer, assistant to the Agricultural Station of Magyaróvár, shows that the variety of barley "Noltch's Imperial," so called after its first grower in Bohemia, M. Joseph Noltch, has proved to be most resistant against unfavourable weather. This variety was imported ten years ago by the Agricultural Station of Magyaróvár. It was distinguished at once for its early maturity and for the high yields which it can give.

The best results were those obtained in the fields of the Arad comitat:

	Date of maturity			Yield per acre		
	1903	1904	1905	1903 lbs.	1904 lbs.	1905 lbs.
Hanna from Kwassitz	12.VII	12.VII	10.VII	1 003	960	667
» » Vodicka.	»	»	—	1 095	1 096	—
Noltch's Imperial. . .	»	»	8.VII	1 122	1 380	675
Farm Hanna.	»	»	9.VII	1 075	975	483

These results and others quoted by the writer show the superiority of Noltch's Imperial over the other varieties. In heavy clay soils it succeded always fully, whilst Hanna often produced grain only fit for feeding to stock. Consequently Noltch's Imperial is a favourite with brewers and always more extensively cultivated by the small Hungarian landowners. The weight per bushel is often 56.9 lbs.; last year it was 54.5 lbs. and the gross yield per acre was 1260 lbs.

The writer has conducted experiments with 8 varieties, and up to the present Noltch's Imperial has always been the most successful, whence he concludes that in heavy soils it will always be advantageous to cultivate this variety instead of the others.

243 – Cultivation Experiments with Spring Barley.

STORMER, K. Anbauversuche mit Samengerste. Mitteilung der Anstalt für Pflanzenbau, Stettin. — *Deutsche Landwirtschaftliche Presse*, Year XXXX, No. 5, pp. 47-48 Berlin, January 15, 1913

For the last five years barley has been grown at Warsaw in the following rotation · 1) peas or beans; 2) winter wheat; 3) oats; 4) potatoes dunged; 5) barley; 6) winter rye; 7) beets dunged; 8) spring wheat. Considering the favourable conditions left by the preceding crop, barley has hitherto been manured only with 3 ¼ cwt. of kainit and 3 ¼ cwt. of basic slag per acre.

The averages for the varieties grown from 1908 to 1911 were as follows:

	bushels (1) per acre
Svalöf Princess	47.1
Svalöf Hannchen	45.9
Original Hanna (from Kwassitz)	44.0
Hummel's Golden Melon	43.2
Lerchenborger	43.1
Svalöf Imperial Primus	38.0
Magdalenen Chevalier (West Prussian)	37.7
Heydenreich's Goldthorpe	30.7

In 1912 barley-growing trials were made at Warsaw on good soils, at Stargard on medium soils, at Köslin on light soils, and at two other places in the province. The wet weather increased the danger from lodging and offered a good opportunity for judging the resistance to lodging of the several varieties. In this respect the Chevalier barleys failed most and thus occupy the lowest position both in yield of grain and in thousand-grain weight; Ackermann's Lower Bavarian also lodged a good deal. Imperial barleys behaved very well as regards resistance to lodging, but in yield of grain they were only average crops. The grain weight is in these kinds very high, and in the case of Noltch's Imperial it was the highest of all kinds grown. The best yields were obtained again, as in all the other experiments, from the barleys of the country. As winner Heil's Franken H 1 is to be mentioned; thanks to its resistance to lodging and to the fine development of its ears the extraordinarily heavy yield of 69.8 bushels per acre was reached. Svalöf Hannchen again took the second place, but its 1000-grain weight was not satisfactory; in yield Rimpau's Hanna was almost equal to it. The highest 1000-grain weight was attained by Heine's Hanna: 46.08 grams. Svalöf Princess failed completely this year, probably on account of the cold dry weather in spring. East Prussian Small Four-rowed gave the lowest yield; it is valuable only as a forage crop under special conditions, as it stands very late sowing, has a short period of vegetation and thrives on the lightest soils.

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(1) Calculated as bushels of 55 lbs. (*Ed.*).

244 – Rice Growing in Louisiana.

SPAHR (Hohensolms, La). Die Zuckerrohr-, Baumwoll- und Reiskultur in Louisiana (1).— *Der Tropenpflanzer*, Year 16, No. 12, pp. 633-645 + fig. Berlin, December 1912

Rice Production in the United States.

State —	Area under rice 1910 — acres	Rice crop 1911 — bushels *
North Carolina	1 000	27 000
South Carolina	17 000	357 000
Georgia	4 000	88 000
Florida	900	19 000
Alabama	1 000	25 000
Mississippi	2 800	84 000
Louisiana	371 200	12 769 000
Texas	264 800	8 738 000
Arkansas	60 000	2 400 000
California	100	3 000

* About 45 lbs. of unhulled rice.

Rice cultivation was begun in Louisiana on the alluvial soil of the Mississippi and its tributaries. The water is conveyed over the levees directly into the supply-trenches, or more usually pumped into special basins, whence it is brought over the levees by siphons. The use of siphons has this advantage: as long as the basins overflow during periods of high water, the apparatus acts automatically and the expense, which is always great, is thereby diminished.

The chief hindrance to rice-growing is the impossibility of replacing costly manual labour by machinery; this is due to the fact that the land falls away rapidly from the river towards the swamps, which makes it necessary to throw up numerous flood dykes; and further, unfavourable conditions of the soil and of the period of flood hinder the complete drying of the fields.

About thirty years ago, rice-growing was attempted with great success in the prairie land of South-West Lousiana; this region produced seven-tenths of the United States rice crop in 1911 (which was 506 million lbs.). Naturally, the rainfall did not supply sufficient water for irrigation, but canals were made (730 miles long in 1911) for the conveyance of the necessary supply. Of late, this water has been paid for by a certain percentage, about one-fifth, of the crop. Districts which are at too great a distance from the canals can obtain water by boring down to a water-bearing stratum of gravel, which occurs at a depth of 150 to 300 ft. A bore-hole of 8 to 10 inch diameter usually supplies sufficient water for the irrigation of about 80 to 100 acres.

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(1) For the articles on cotton and sugar cane, see Nos. 125 and 128, *B.* Feb. 1913. (*Ed.*)

Varieties. — "Upland' rice is little cultivated; it is only used for local consumption and as a poultry feed. It grows on heavy soil, but only on such light soils as are low-lying and damp. After the ground has been prepared, the rice is sown in rows about 2 ft. apart. The soil has to be kept sufficiently wet and the growth of weeds checked. Work in the rice-field ceases with the appearance of the ears. Harvest takes place in August or the beginning of September. The varieties chiefly cultivated are Honduras and Japanese rice.

"Lowland" rice is the one usually grown in Louisiana; this belongs to the same type as the "Upland" variety. The cultivation of Carolina rice has fallen off much of late, for red rice (*Oryza sativa* var. *rufipogon*) often makes its appearance amongst it. The latter was a cross between the two varieties and the hybrids showed further mutations. Carolina rice is less resistant to disease than the foreign varieties. Some years ago, a Rice-Growing Experiment Station was established at Crowley; it is especially engaged in the selection of disease-resisting and hard-grained varieties; some of the varieties at present grown give on polishing up to 90 per cent. of broken grains.

Honduras rice only is grown in the alluvial district, while the Japanese variety is cultivated on the prairie. The former grows the more luxuriantly, but is more prone to lodging than the latter; it ripens earlier than Japanese rice and thus fetches higher prices. It is therefore becoming the practice in the prairies to plant both varieties in order to benefit by the early maturity of the one and to increase the length of harvest time.

Preparation of the soil. — The soil may be worked either dry or wet. In the former case it is ploughed in winter or early spring, and well broken up with the disc harrow in the case of heavy soil with clods; but where the soil is lighter the rotating toothed-harrow is used. If the soil is very hard to work (as on the prairie after fallow) the fields are irrigated, ploughed wet, and sown immediately afterwards. Ploughing in alluvial land is 2 to 3 inches deep the first year, getting gradually deeper each succeeding year. On the prairie some plough 6 inches, others only 3, as they reckon that deep ploughing makes harvesting heavier owing to the machine sinking too far into the ground.

The necessary dykes are thrown up by plough, mattock or spade; owing to the sharp fall of the alluvial land towards the swamps, the fields cannot be large and are often only 1 ½ to 2 acres, rarely 3 or 4, in size, though on the prairie they are larger.

Sowing. — In the alluvial district, sowing is usually done in late March or early April, with a broad-casting machine; 45 to 65 lbs. of seed are used per acre, and it is purchased fresh every year.

On the prairie, the Japanese rice is sown from early April to the middle of June, while the Honduras variety is put in as early as possible. The seed is usually drilled, which saves seed (40 to 50 lbs. being used per acre) and gives a heavier crop.

In wet cultivation the rice is sown in late April or early May, and the water is well mixed with the soil by means of mules drawing planks or bundles of branches. When the mud has settled over the seed, the excess of water must be drained off.

In normal seasons the rice is tall enough to allow of the field being flooded in five weeks, but in dry years it takes longer, sometimes even twice as long, to grow the required amount; recourse is then had to temporary irrigation. The field must be flooded without delay if weeds threaten to smother the crop; sometimes it is necessary to mow the whole field to the surface of the soil, and to irrigate at once; the rice sprouts again, but the weeds remain below the water and perish.

Irrigation is carried out in such a manner that the water flows on from one field to the others. In the alluvial district, the depth of water varies from 6 to 12 inches; in the highest parts of the prairie it is only an inch or so and in the lowest from 4 ½ to 7 inches. The writer does not advise flooding deeper than 4 inches, as too much water promotes lodging and decreases the crop.

The worst weed in rice-fields is red rice (*Oryza sativa* var. *rufipogon*); others are *Sesbania macrocarpa* Muhl. and *Aeschynomene virginica*, the last especially in the alluvial district. Weeding is done by hand; this work is readily performed by the negroes, adults being paid 80 or 90 cents and children 40 cents.

As soon as the rice begins to turn yellow and the ears to droop, the water is drawn off. A fortnight later, the crop is ripe for harvest; this occurs for the Japanese rice in the alluvial district in the middle of July and on the prairie at the beginning of August. The Honduras variety is cut earlier.

Harvesting. — In the alluvial district, the rice is cut with a sickle; the stubble is left standing till the rice dries. When cut, the rice is made up into sheaves and placed in heaps, where it remains till it is threshed. On the prairie binders are used; the writer recommends those made by Cavoliere Balbo Bertone (Turin), of which he gives a description.

Threshing is effected as soon as possible, so as to prevent damage by bad weather. Sometimes stacks are made of the size of a waggon-load; by this means the rice heats; as soon as the temperature has reached its maximum, it gradually falls and the stack dries, as does the grain, which becomes very hard and on husking is very white and brilliant. The rice is, however, not usually stacked to improve the quality of the grain, but from necessity, when no threshing machine can be got, or if bad weather sets in. In such cases the stack is often built on a wooden platform.

Yield. — The average crop is 10 to 20 sacks of 162 lbs. of unhusked rice per acre, minimum 6 sacks, maximum 27 sacks. In 1911, there were 35 rice-mills in Louisiana. The straw is used sometimes as forage, otherwise it is left on the field, or burnt.

In rainy seasons, the rice stubble soon sprouts again and is cut green, when it makes a valuable feed; if the harvest has been bad, however, this second crop may also be allowed to ripen and it amounts to about one-eight of the normal first harvest.

Rice is seldom grown more than four years in succession on the same field. When aquatic weeds get very bad, the field may be left fallow for two or three years. Fertilizers are practically not used.

Enemies of rice. — Rice mildew (*Pyricularia oryza* Bri. and Cav.) occurs chiefly in the south-west of Louisiana, where it causes a loss of from 5 to 25 per cent. of the crop. There are no efficacious means of controlling this fungus. The most resistant varieties are Honduras and Japanese rice.

Obalus pugnax Fabr. and other insects of the same family (Pentatomidae) bore into the grains and extract the juice. The wounds afford good points of attack for fungi and bacteria, which develop and form black patches. The loss occasioned is from 10 to 25 per cent. No good remedy against these enemies is known. Japanese rice suffers more than does the Honduras variety.

Rice-birds (*Dolichonyx oryzivorus*) also do great damage in places.

245 - *Phaseolus lunatus* Beans.

Bulletin of the Imperial Institute, Vol. X, No. 4, pp. 653-655. London, December 1912.

A death which recently occurred on the Dankanda Estate, Matale, Ceylon, through eating the beans of *Phaseolus lunatus*, which bear the local names of *Veli Bonchi* (Tamil) and *Potu Dambala* (Sinhalese), gives point to the warnings that have been repeatedly published during the last ten years as to the dangerous nature of the beans produced by certain varieties of *P. lunatus*. The following four kinds of these beans are known:

1. Medium-sized, rather flat, somewhat shrivelled beans, varying in colour from dull purplish-red to nearly black. This kind is represented by the "Java beans", which were imported some years ago to various European countries, and caused numerous cases of poisoning among cattle fed with them (1). These beans yield comparatively large quantities of prussic acid when ground and moistened with water. This variety is only fit for use as a green manure.

2. Small reddish beans, which are usually plump and occasionally show purple spots. This variety is represented by the "red Rangoon" or "red Burma" beans, which are largely exported from India. When ground and mixed with water they yield minute and usually harmless amounts of prussic acid. So far as is known, no poisoning case has arisen from their use.

3. Small white beans, usually plump. "White Rangoon" or "white Burma" beans belong to this kind. They generally yield mere traces of prussic acid.

4. Large plump white beans. This variety is represented by "Lima beans", which are largely cultivated in the United States, Southern Europe, Madagascar and elsewhere for use as a vegetable. Numerous samples of this kind have been analyzed; and only a few yielded mere

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(1) See No. 2263, *B.* July 1911; No. 792, *B.* May 1912. (*Ed.*).

traces of prussic acid, most of them showing none at all. This variety seems perfectly safe for use as a human foodstuff, though wherever it is grown for the first time samples from the first few crops shou'd be analysed in order to ensure that no deterioration to a less desirable variety has occurred.

Recent statements in the Indian Press express a fear that the export of Burma beans is doomed to extinction. The writer notes that the export trade of these beans is still flourishing, notwithstanding the fact that the discovery of the poisonous nature of some of these beans was made at the Imperial Institute as long ago as 1903.

These beans are regarded with some suspicion by experts and they command comparatively small prices in the market. In view of this, the Imperial Institute has recently suggested to the Department of Agriculture in Burma that steps might be taken to encourage the natives to cultivate a better class of beans tor export, and samples of the kinds of product required have been forwarded for trial cultivation.

246 - **Yam Growing in Jamaica and in Queensland.**

ROOT CROPS

1. SOMERVILLE, R. C. Yam Growing in Hanover. — *The Journal of the Jamaica Agricultural Society*, Vol. XIV, No. 12, pp. 648-650. Kingston, December 1912.

2. Growing Yams. — *The Queensland Agricultural Journal*, Vol. XXX, Part 1, pp. 45-46. Brisbane, January 1913.

1. *Yam Growing in Hanover, Jamaica.* — The yam tuber takes the foremost place of all the vegetable foods grown in Jamaica in the diet of the labouring classes. In every parish it is grown to a greater or less degree, but the methods of planting and cultivating differ considerably in the various districts. The most important yam-growing centre is Hanover, which produces the Lucea yam or, as it is called in Hanover, " Doctor Dick ". This variety thrives best in Hanover, although it gives satisfactory results in Upper St. James, Westmoreland and some parts of Portland.

The plants are spiny; the tubers are white when cooked and of regular shapes; they keep well, pack easily and are resistant to transport. In Upper Hanover the yam fields are situated on the slopes of the mountains which are too steep for bananas. The hills are dug very close together, 2000 to the acre. Two " bits " (extremities of the tubers), each with an eye, are planted in each hill. The Doctor Dick requires tall sticks for support. A good worker can dig 150 hills per day. The average yield per acre is about 4 tons, but under very favourable conditions as much as 6 tons can be harvested.

The cost of cultivating one acre of yams is the following:

	£	s	d
Rent	1	0	0
Cutting and cleaning	2	0	0
Digging 2000 yam hills including planting	2	10	0
2000 sticks	1	0	0
Sticking out yams		10	0
Two weedings	1	0	0
Total cost	8	0	0
Carriage to the port of Lucea	4	0	0
Total cost of the produce of one acre of yams at the port	12	0	0

The yams are sold in Lucea at £8 per ton, bringing in a gross income of £32.

The cost of buying plants is left out as that once done the grower will always have enough to plant.

It has been calculated that the yam industry means an income of £40 000 annually to Hanover.

Another variety of yam is also cultivated in Hanover; The "Afou" or yellow yam; it is a great favourite in the local markets, but it will not keep long and is therefore useless for foreign trade.

It is planted even closer than Doctor Dick and requires short sticks.

2. *Yam growing in Queensland, Australia.* — In the early days, when some thousands of kanakas were employed in the Queensland sugar plantations, yams were largely grown, as they formed part of the labourer's rations. Since black labour ceased in the State, the cultivation of the yam has fallen off. The tuber, perhaps owing to its glutinous nature, is not much appreciated by the white population. The yam requires a warm damp climate to be produced to perfection, but it thrives under conditions where the sweet potato would not do so. It is propagated by setts from the roots, or by small bulbs which are planted in rows 3 feet apart, the setts being at the same distance from each other. The best planting season is September, and the crop will be ready in from five to eight months. After planting a stout stake is set near each hole. The Papuan natives, who grow large quantities of yams, often lay branches over the setts and allow the vines to run over them, thus giving the plants air and preventing a luxuriant growth of weeds. The after cultivation is trifling and consists in weeding and loosening the soil; and where poles are used, the cultivator can be run between the rows, and with a Dutch hoe the weeds can be destroyed close up to the plant.

The best known edible kinds are *Dioscorea bulbifera*, *D. aculeata* or Guinea yam, and *D. globosa*, the last being the kind most highly esteemed in India. The bulbs of *D. rubella* attain a length of 3 feet. *D. alata* (the winged yam) is the most productive. The Cush-Cush Yam (*D. try-*

phylla) is called in Jamaica the Indian Yam, and in British Guiana it is known as the Buck Yam. The tubers are roundish and rarely exceed 9 inches in length and 3 in. in diameter. It is the smallest and most delicate of all the yams. The plant is prolific, sometimes bearing a dozen tubers on the roots.

FORAGE CROPS. MEADOWS AND PASTURES

247 - A New Variety of Rye Grass.

The Journal of the New Zealand Department of Agriculture, Vol. 5, No. 5, pp. 484-486 Wellington, N. Z., November 1912.

The Western Wolths Grass is a variety of Italian rye grass said to have originated from a plant plucked from the roadside by a Dutch peasant. It is characterised by its extremely rapid and vigorous growth, and in the past season, at the Ruakura Farm of Instruction, yielded 15 tons of forage per acre at the first cutting. It has proved excellent feed for dairy cattle and provides several good subsequent cuttings. The seed is indistinguishable from ordinary Italian rye grass, and buyers should be careful to purchase seed guaranteed true to type.

FIBRE CROPS

248 - The Cotton Industry of Nyasaland.

Bulletin of the Imperial Institute, Vol X, No. 4, pp. 527-536. London, December 1912.

The introduction of cotton growing into Nyasaland is of comparatively recent occurrence, a few consignments being exported for the first time in 1902; but already a large industry has been worked up, the rapid growth of which may be judged from the following table:

Years	Quantity lbs.	Value £
1902–1903.	692	No complete returns
1903–1904.	58 897	1 778
1904–1905.	285 185	5 941
1905–1906.	776 640	16 180
1906–1907.	526 119	15 345
1907–1908.	403 486	13 998
1908–1909.	756 120	28 355
1909–1910.	858 926	26 209
1910–1911.	1 736 999	58 687

In the early days of the industry all kinds of cotton were grown, but many of these were unsuited to the climatic conditions of the Protectorate: and owing to the different varieties being grown in proximity hybridisation was common, resulting in the deterioration of those types which, under proper conditions, would have given good results. The only types now grown on a commercial scale are Egyptian varieties which are confined to the warmer districts of the Lower river, and long-stapled American Upland forms, which are cultivated only on the higher lands. As a general rule Egyptian cottons are grown in Nyasaland at elevations below 2000 ft., and the American kinds from 2000 to 4000 ft.

By careful selection of "improved" American Upland varieties, a type of cotton has been evolved which has now become acclimatised and is recognised as a distinct commercial variety under the name of "Nyasaland". At the present time this cotton is regarded as the best grown in Nyasaland from Upland seed. Of the total area under European cultivation in the Protectorate in 1912, 23 000 acres were devoted to Nyasaland Upland and 755 acres to Egyptian cotton.

Accounts of the cotton industry in Nyasaland and of the selection experiments with Nyasaland Upland cotton have been given in the *Bulletin of the Imperial Institute* of 1909, 1910, 1911 and 1912. A summary of the results of the examination of cotton samples from Nyasaland was published in a *Report on British Cotton Cultivation* (No. 50, *Colonial Reports, Miscellaneous Series* [Cd. 3997] 1908).

The article under review refers to the results of the examination of the samples received in the last few years and belonging to the "Improved American Upland", Egyptian (Mitafifi, Abassi, Nubari) and Brazilian varieties.

249 - **Ramie.**

DEWEY, LYSTER H. — *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 103, pp. 9 + 2 figs. Washington, December 27, 1912.

Experiments in the cultivation of ramie have been carried on in the United States since 1860. Although none of them so far have led to a commercial industry, several kinds of ramie goods are appearing in increasing quantities in the American markets. Some mills are now engaged in the manufacture of these goods and others are being equipped for the work.

Ramie is cultivated commercially in China, in Japan, including Taiwan (Formosa), in Chosen (Korea), and to a limited extent in India and Africa.

Numerous experiments have demonstrated that it can be grown on suitable soils from Maryland to Texas; also in California and Porto Rico.

A warm, moist climate is essential for the successful cultivation of ramie: warm temperate climates rather than the tropics. Unless grown under irrigation or on moist bottom lands it requires at least 40 inches of well-distributed rainfall. It requires a rich, deep, moist soil, well drained, yet not subject to drought. The following data were obtained by Prof. E. W. Hilgard at the California Agricultural Experiment Station.

Ramie is propagated by root cuttings or by seeds; in the former case they grow more quickly and with more certainty. The seed beds must be covered with a cloth to keep the atmosphere warm and saturated with moisture. When 6 to 10 weeks old the seedlings may be transplanted to a nursery, and two months later they may be set out in the open field at 20 to 30 inches apart in rows 3 to 4 feet apart. The land between the rows must be cultivated. If irrigated, the furrow system must be used to avoid covering the young plants with water.

Soil ingredients (in pounds) withdrawn from 1 *acre by a crop of ramie.*

Soil ingredients	Leaves (8 500 lbs.)	Stalks (14 500 lbs.)	Bark (5 500 lbs.)	Whole plant (28 500 lbs.)
Potash	68.13	155.99	27.86	251.98
Soda	8.90	33.63	7.52	50.14
Lime	566.91	71.77	19.14	657.82
Magnesia	114.58	43.68	10.01	168 27
Manganese oxide	1.92	1.45	0.20	3.57
Ferric oxide and alumina	38.56	12.16	0.71	51.43
Phosphoric acid	77.13	67.71	10.86	155.70
Sulphuric acid	30.86	14.53	3.17	48.56
Silica	692.71	7.06	4.48	704.25
Chlorine	41.56	2.50	7.79	51.85
Total ash constituents	1 641.35	410.85	91.74	2 133.57
Nitrogen	206.10	105.85	57.75	369.70

The first stalks of ramie are usually much branched and of no value. It is best to cut off the first shoots when they are 10 to 30 inches high to induce a thicker and more uniform growth of shoots. Afterwards one to four, usually two, crops are cut each year. In Asia each stalk is cut as it matures, leaving the younger stalks to grow. If the ramie is to be decorticated green it must be stripped immediately after being cut; if the operation is to be carried out when dry the ramie should be cured in the swath or gavel and care must be exercised to avoid heating or molding. The strips of bark with the fibre are called " ramie ribbons ". The hand-cleaned fibre free from the bark and pulp is called " China grass ". The fibre in order to be spun is degummed by chemical processes and then combed to remove the short fibres or " noils " from the long ones or " tops ". Both tops and noils are spun.

The yield of stalks usually increases up to the fourth year. The following data are based on numerous experiments made in France:

Yield of ramie stalks and fibre in pounds per acre

Year	Green stalks	Air-dry stalks	Dry fibre
First	6 000	1 500	300
Second	12 000	3 000	600
Third	18 400	4 600	900
Fourth	26 400	6 600	1 300

The production of raw fibre from two annual cuttings in experimental plantings ranges from 500 to 2800 lb. with an average (eight different authorities) of 1293 lb. The yield of dry fibre is 3 to 5 per cent. of the weight of the green stalks, or 15 to 20 per cent. of the air-dry stalks. In Formosa, where three or four crops are harvested each year over about 5000 acres, the average annual yield is about 700 lb. per acre. In Hunan, and Hupeh, China, the annual yield is 400 to 600 lb. of China grass per acre from three crops.

The ramie fibre, cleaned by hand in China, can be delivered in San Francisco or New York at 6 to 10 cents (about 3*d.* to 5*d.*) per pound. It is roughly estimated that the importations of China grass into the United States now amount to nearly 1 000 000 lb. annually, besides considerable quantities of yarns and some degummed filasse from Europe. Hongkong is the principal shipping port for the fibre.

The cultivation of ramie is limited to the countries having cheap, skilled hand labour; this is chiefly due to the lack of satisfactory mechanical methods for separating the fibre. Recently some European firms have put on the market some machines for this purpose, and some very promising work was done in trials with a machine built in the States to decorticate ramie fibre from the dry stalks. Fibre decorticated from green stalks is desired for most degumming processes, and machines are now being perfected for this work.

The outlook for the ramie industry in the United States appears promising. The question, however, remains whether this fibre can be produced at a cost permitting it to compete with the Chinese fibre.

250 - The Cultivation of Sisal Hemp in German East Africa.

Die Sisalkultur in Deutsch-Ost-Africa. — *Verhandlungen des Vorstandes des Kolonial-Wirtschaftlichen Komitees*, No. 2, pp. 39-48. Berlin, December 5, 1912.

This paper is the result of a journey of investigation undertaken by Dr. W. F. Bruck.

Importance of the Cultivation. The cultivation of *Agave sisalana* (Sisal Hemp) in German East Africa, where it has been introduced only within the last twenty years, has already proved to have a sure future before it, and to be specially suitable to the country. In 1911, 11 035 tons of sisal fibre worth £220 000 were exported from the Protectorate. For 1912 an exportation of at least 16 240 tons was reckoned upon, at a price of £34 17*s* 6*d* per ton for the best quality, and it is calculated that the yearly export will soon attain 20 000 tons, worth about £500 000.

Soil. — *Agave sisalana* thrives in German East Africa under the most various conditions of soil and of climate: on the fertile soils of the Usambara mountains; on the red loams produced by the disintegration of gneiss; on the calcareous soils of the coast, sometimes also red and derived from the desintegration of coral rocks; and on the typical steppe soil (near Kilossa). As for the quality and quantity of the fibre produced, the best results are those obtained on medium and poor soils.

Cultivation. — *Agave sisalana* is important in German East Africa only as a cultivated plant. It is generally propagated by means of suckers, mostly about 20 inches long and which develop better the older they are. They are generally planted out at once, being rarely put into a nursery. In soils that are not too rich the first cut may be made after three years. As a rule cropping goes on for five to seven years; a plantation lasts about ten years. This holds true for medium soils; in the rich virgin soils the crop begins earlier; thus, in the Usambara district the first cut may be made eighteen months after planting, but the plant may be exhausted after three years. In very poor soils, for instance on the coast (limestone or rocky soil), the first crop is secured only 4 or 5 years after planting, but the plants live much longer.

In careful cultivation the suckers which form around the base of the adult plants are removed; in neglected or "wild" plantations, as the writer calls them, they are allowed to grow. With the latter system the crop of leaves is heavier but they and the fibre they yield lack uniformity. Besides, it hinders the removal of weeds, which overrun the whole ground and very probably favour the actions of fungus and other pests. Careless cultivation, it is believed, can also lead to the degeneration of the Agave. In Java the species is already partially degenerated. The writer recommends regular cultivation at certain distances between the plants and with systematic weedings.

If other plants are not grown between the rows the agaves should be planted 4 ft. to 7 ½ ft. apart, according to the soil. For planting between the rows cotton has often been adopted; in particularly suitable localities this has given good results, defraying a good deal of the cost of planting and working before the principal crop began to bear. But where there is no certainty of a rainy and a dry season, mixed plantations are not advisable. As normally sisal hemp does not yield such large profits as other tropical crops, and as on the other hand the Colony has no lack of virgin soils, the writer advises, for the present, the extensive rather than the intensive cultivation of the plant.

For the improvement of exhausted lands, Leguminosae might be sown between the rows or fallowing resorted to.

Production and economic considerations. — As a rule each plant should give 200 leaves suitable for the extraction of fibre, which must amount to 3.5 or 4 per cent. of the leaves and be of good quality. The Krupp scutching machine works satisfactorily.

In making an agave plantation the estimates must be based on a production capable of supplying sufficient material to keep one or two scutching machines uninterruptedly going, calculating on 100 000 to 120 000 leaves per day per machine for 300 days per annum.

The Colony disposes of land suitable for a further extension of sisal cultivation, but this is checked by the want of labour. There is no fear at present of an excess of production, as with prices at £22 10*s* to £27 7*s* 6*d* per ton sisal hemp is a very profitable crop in plantations systematically cultivated. Besides, if the example of Mexico were followed—where sisal has been cultivated for the last forty years—alcohol, wax, oxalic acid, compressed fuel and paper could be prepared from the by-products remaining after the extraction of the fibre.

251 - The Hemp Industry.

FERRIS, W. H. in *The Journal of the New Zealand Department of Agriculture*, Vol. 5, No. 5, pp. 516-517. Wellington, N. Z., November 1912.

The production of *Phormium tenax* is diminishing in importance in the Auckland district. With better drainage of the great northern swamps it was expected that the production of fibre would expand, but with the development of drainage the swamp lands are proving valuable for agricultural purposes and the *Phormium* plant is gradually disappearing. It is still produced to a considerable extent in the Tawa Swamp (between Te Awamutu and Te Kuiti) and in the swamps on the east coast; but generally there is small chance of fibre extraction proving a stable industry in the north of New Zealand. Auckland *Phormium* is practically unaffected by disease, but it is inferior to the southern leaf. It is more irregular in length, while the fibre is not so strong.

On the other hand, in the northern Manawatu, *Phormium* covers about 15 000 acres of land in one solid block, which it will occupy until means have been devised to prevent its periodic flooding by the Manawatu River. The huge quantities of leaf surrounding the mills enable the cost of production to be reduced to a minimum and afford mill hands a guarantee of employment, thus providing better qualified labour and encouraging millers to erect up-to-date mills.

Considerable activity in the fibre industry is being displayed in the south of New Zealand. In several cases mills are being equipped with the latest labour-saving machinery. The installation of the automatic washing-machine has considerably improved the colour of the fibre and effects a saving of time.

252 - "Assa-peixe" of Brazil: Substitute for Hemp.

DE MORAES, PASCHOAL. Un precioso succedaneo do Canhamo, etc. — *Chacaras e Quintaes*, Vol. VI, No. 6, p. 12. São Paulo, Brazil, December 1912.

This plant, which grows wild in Brazil, where it is known as "Assa-peixe", appears to be *Boehmeria caudata* Swartz; it grows in abundance in all the north of Brazil, covering extensive areas; its stem frequently attains the height of 6 feet and is used in Bahia for trifling purposes; but its fibre, which for its tenacity and abundance would deserve to be worked, is neglected. "Assa-peixe" is a very hardy plant, having very moderate wants in the matters of the nature of the soil, quantity of rainfall, cultivation and manuring.

253 - General Review of the Beet Sugar Industry in the United States.

SUGAR CROPS

CLARK, W. B.: *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 260, pp. 15-30. Washington, November 1912.

From a consideration of results obtained in Europe, the most favourable regions for the growth of sugar beets in the United States were predicted to lie on either side of the summer isothermal line of 70°F., and at the present time the industry has developed in three main localities within this area:

1. *The Californian Region*, in southern and central California.
2. *The Intermountain Region*, chiefly in Colorado, Utah and Idaho.
3. *The Great Lakes Region*, in Michigan and Wisconsin, with the adjacent parts of Ohio, Indiana and Illinois.

Besides these there are a few scattered factories, some of which give indications of considerable future growth.

The rainfall varies widely within these regions. It ranges from under 10 in. per annum in the semi-arid parts of the Intermountain Region, where beets can only be raised with irrigation, to 30 or 35 in. in the humid climates of the Great Lakes Region. The length of the growing season, excluding subtropical districts of California and Arizona, varies from 130 to 170 days. The cost of growing an acre of sugar beets is computed at from $ 32 (£6 11*s* 6*d*) to $ 43 (£8 16*s* 9*d*), excluding the rent of the land, and the yields vary from 8 to 13 short tons (7 to 11 ½ English tons) per acre. With regard to the bye-products: the tops are utilized by feeding them green in the field, and their market value is reckoned at $ 2 to $ 4 (8*s* to 16*s* 6*d*) per acre; the exhausted pulp is sold as cattle food either in a wet, fermented state, worth 25 to 35 cents per ton., (1*s* 2*d* to 1*s* 7*d* per ton), or in a dried condition at about $ 15 a ton., (£3 9*s* per ton); molasses are produced only in small amounts and sell for about $ 10 a ton (45*s* per ton.); lastly, the lime and waste water are not put to any economic use at present.

During the last 25 years the home-grown beet-sugar crop has risen from nothing to one-eighth of the total home consumption — the acreage harvested in 1911 being little less than 475 000 acres. It is estimated that if less than 1 per cent. of the improved land in the States in which it is known that sugar beets can be successfully grown were planted with this crop, it would be unnecessary for the United States to buy any foreign sugar.

254 – Improvement in the Shape of Sugar Beets.

SEVERIN, C. De l'Amélioration de la forme de la betterave à sucre — *Journal d'Agriculture Pratique*, Vol. I, Nos 1 and 2, pp 11-12 and 48-50. Paris, January 1913.

Some experiments were undertaken in order to estimate the part played by the shape of the root in the labour of harvesting the crop. The root was seized just below the crown by a clutch to which a dynamometer was attached; it was then pulled, and the work done in the operation thus recorded. Each root was subsequently weighed.

The nature of the soil naturally has an important effect on the results obtained, but in the same field the long tapering beets or those with fangs or lateral roots gave a much higher figure than the short globular ones. When the results are reduced to traction in pounds per unit weight (lb.) of root, the average figures for the different varieties varied from 64.4 lbs. to 89.8 lbs. Analyses of these two extreme cases showed that the quality of the root was in no way connected with the shape; so that, with care in selection, it is reasonable to hope that varieties may be obtained which will considerably reduce the labour, and consequently the cost, of harvesting the crop.

255 – The Insect Visitors of Beet and Mangold Flowers (1).

UZEL, HEINRICH. Ueber die Insekten, welche die Bluten der Zucker- und Futterrübe besuchen. — *Zeitschrift für Zuckerindustrie in Böhmen*, Year XXXVIII, Part 4, pp. 182-197 + 2 figs. Prague, January 1913.

Recalling the experiments of K. Andrlik, V. Bartôs and J. Urban (2), who demonstrated that beets possessing a high sugar content give rise to descendants with lower sugar content when they are crossed with beets containing less sugar or worse still with mangolds, the writer observes that the opinion that beet flowers are anemophilons is widely spread, while both direct observation and the structure of the flower and of the pollen show that insects play a great part in the fertilisation of beets. In fact, the flowers have nectaries and they are scented; the pollen has a rough surface and is very sticky. There are species of insects which regularly visit beet and mangold flowers; they consequently render undesirable crosses, even at great distances, possible. Such insects seek chiefly nectar and subordinately pollen; some devour or suck the flowers and the other parts of the flower clusters; while others again prey upon the insect visitors. All come into contact with the pollen and all of them can carry it about.

In Bohemia, on the flowers and flower clusters of sugar beets great numbers of the following insects may be observed: in the first place

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(1) See No. 1168, *B.* Aug. 1912. (*Ed.*)

(2) See No. 121, *B.* Jan. 1911. (*Ed.*).

Thrips communis * Uzel; then the flies: *Syritta pipiens* * L., *Sarcophaga carnaria* * L. and *Ceratopogon bipunctatus* * L.; after which follow the Hemiptera: *Lygus campestris* L., with its larvae, *Calocoris lineolatus* Goeze, *Campylonum verbasci* H. Sch.; the Cicadid *Chlorita flavescens* Fab.; lastly the Coleoptera: *Sitona sulcifrons* Thunberg and *Apion virens* Herbst. The writer has observed in fairly considerable numbers the Thysanoptera: *Physopus atrata* * Halid., *P. vulgatissima* * Halid. and *Aeolothrips fasciata* * L.; the flies: *Melithreptus dispar* * Löw, *Polennia rudis* * Fab. and *Spilogaster quadrum* * Fab.; the Hemiptera · *Triphleps nigra* Wolff.; the Tenthredinid *Athalia spinarum* * Fab. and the Podurid *Sminthurus luteus* Lubb.

The following are not frequent. Diptera: *Sciara pallipes* Fbr., *Scatopse pulicaria* Lw., *Oscinis pusilla* Mg., *Phorbia platura* Mg.; Coleoptera: *Fachyporus chrysomelinus* L., *Sitona lineatus* L., *Apion seniculus* Kirb., *A. apricans* Herbst. and *Phyllotreta nigripes* Panz.

The following are rare. Coleoptera: *Stenus ater* Mannh., *Tachyporus hypnorum* F., *Meligethes aeneus* F., *Sitona hispidulus* F., *S. humeralis* Steph., *Apion varipes* Germ., *A. aestimatum* Germ. (= *trifolii* Bach); Diptera: *Onesia sepulcralis* Mg., *Sarcophaga vagans* Mg., *Melanostoma mellina* L., *Hylemyia cinerella* Mg., *Chlorops didyma* Ztt., *Phorbia humerella*, *Sciara flavimana* Ztt., *S. pulicaria* Mg., *Simulia maculata* Mg., *Sepsis cynipsea* L., *S. punctum* Fbr., *Clasiopa obscurella* Fall. and *Syrphus balteatus* Deg.; lastly the bee *Halictus pauxillus* F., and species of the families Proctotrupidae and Chalcididae.

As for mangold flowers, the writer has observed that in Bohemia they are visited with the greatest frequency by the flies: *Syritta pipiens* * L. and *Sarcophaga carnaria* * L., to a certain extent also by the flies: *Melithreptus dispar* * Löw, *Polennia rudis* * Fab. and *Spilogaster quadrum* * Fab. All these species often visit the flowers of sugar beets also. On the mangold flowers in isolated cases the following flies have been observed: *Sarcophaga striata* Fab., *S. hæmatodes* Mg., *Exorista vulgaris* Fab., *Cynomyia mortuorum* L., *Spilogaster duplicata* Mg. and *Hylemyia variata* Fab.

Next follows a description and considerations on the life history of the insects which visit in great numbers the flowers of sugar beets, or stay on them. Some of these insects visit mangolds also.

The following species are found in great numbers on the flower clusters of sugar beets; they suck the juices from the stem, the leaves and the flowers or devour these parts. Coleoptera: *Sitona sulcifrons* Thunb. (especially injurious to young leguminous plants), *Apion virens* Hbst., *Phyllotreta vittula* Redt.; Hemiptera: *Lygus campestris* L. (often injurious to colza, rape, dill, parsnips, chrysanthemums and dahlias; it is believed that the allied species *L. pratensis* (1) causes notable damage to sugar beets in North America) ; *Colocoris lineolatus* Goeze (sometimes especially injurious to hops and in a lesser degree to potatoes, cabbages and ornamental plants); *Campylomma verbasci* H. Sch. ; *Triphleps minuta* Wolff (observed by the author to chase Thysanoptera ; in North America Thysanoptera are preyed upon by *Triphleps insidiosa*) ; the Cicadid *Chlorita flavescens* Fab. ; the Podurid *Sminthurus luteus* Lubb.

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* The asterisks denote the species which are frequent in the flowers or on them. (*Authors' note.*

(1) See No. 1381, *B.* Sept. 1912. (*Ed.*)

The writer lastly quotes the works he has consulted for the compilation of his paper.

250 – Baobab Oil.

REY H. Notice sur l'huile de Baobab. — *Bulletin Economique de Madagascar et Dependences*, Year 12, No. 2, pp. 135-140. Tananarive, 2nd Half-year 1912.

The baobab (*Adansonia digitata L.*) presents in the Sakalave Menabe country three varieties : " rainiala ", " fony " and " zaha ". The fruit of the first variety is oblong, covered when ripe with a thick fine brown down; that of the second is round, slightly velvety and dark green, while the fruit of the third variety is long and ellipsoidal in shape; its skin is thick, wrinkled and black when ripe.

These trees attain gigantic dimensions; " rainiala ", the largest of all, ordinarily reaches a height of 40 to 50 feet, and the average circumference of its trunk is 20 to 23 feet. But these dimensions are frequently surpassed.

" Zaha " is the first to bloom, " fony " is the second and " rainiala " the third. The best time for gathering the " zaha " crop is the first fortnight of September; for " fony " the second fortnight of October and for " rainiala " the month of November.

For the extraction of the oil the natives free the nuts from the pulp which envelops them; they then crush them in a rice mortar and place the compact mass thus obtained in a vessel and cover it with 8 to 10 inches of water. It is boiled over a brisk fire for the first half hour and then gently for several hours. The oil begins to appear about two hours after the vessel has been placed over the fire, and about eight hours are required in order to obtain the maximum yield of oil.

Yield of fruit and seeds. — The following data give the averages of the yield of each variety:

	Rainiala	Fony	Zaha
Number of fruits per tree	80	70	60
Average weight per fruit in oz.	10	7	7
Average number of seeds per fruit	95	100	75
Average weight of seeds in 100 fruits in lbs. . .	22	15	11
Average quantity of oil per 100 lbs. of seeds in gals.	1	0.6	0.5

It must be added that for the same variety the fruits are more numerous and larger on the trees growing on rich soils, and that by the use of European machinery for extracting the oil by means of pressure, the amount of oil for the same weight of seeds may be quadrupled.

The above table shows the commercial superiority of " rainiala " over the other two varieties for its greater number of fruit and more abundant yield of seeds and of oil. The " zaha " variety, notwithstanding its lower production and the difficulty of treating the fruit (owing especially to the thickness of its rind and to the dense fibrous network that fixes the seeds to the pulp) may nevertheless be taken into consideration for its oil, as the fructification of these three varieties extends over several weeks.

Chemical composition and industrial value of the oil. — M. Millian, Director of the Laboratory of the Colonial Garden, has studied Baobab oil and seeds. The oily seed has the shape of a hazel nut encased in a thin resistant shell adhering to the pulp, which represents about 20 per cent. of the weight of the seed. In the centre there is a white pulp capable of yielding oil by pressure; the rest is a kind of flour without starch. These three constituents are found in the following proportion:

Oil	39.01 per cent.
Moisture	7.20 "
Shell and dry flour	53.78 "
Total	99.99

The seed does not contain any injurious product, so that the cake obtained by pressure might be used as food for live stock. The expressed oil has a fine yellow colour, its odour is pleasant; it solidifies at 13° C. and is especially rich in fatty acids solidifying at normal temperatures; the liquid part appears to be exclusively formed by oleic acid, while the solid part is a mixture of stearic and palmitic acids. The oil could be used for food or for the preparation of artificial butters and margarine, and it might take the place of olive oil in pharmaceutical preparations and in perfumery. It would be very suitable also for making fine soaps, stearin and lubricants.

Harvest and yield. — In order to gather the fruit the Sakalaves drive wooden pegs into the trunk, situating them so as to form a ladder by means of which they reach the top of the tree; they then use poles to knock the fruit down.

The following table gives the yield in oil from a ton of seeds and its cost according to the process used, *viz* the European or the native.

Variety	Native process	European process
Rainiala . .	Maximum yield 22 gals. Average price per gal. 7*s* 2*d*	Minimum yield 79.2 gal. Average price per gal. 1*s* 6*d*
Fony	Max. yield 13.2 gal. Average price per gal. 11*s* 8*d*	Min. yield 48.4 gal. Average price per gal. 2*s* 5 ½*d*
Zaha	Max. yield 11 gal. Average price per gal. 14*s* 5*d*	Min. yield 39.6 gal. Average price per gal. 3*s* 0*d*

Baobabs are found in abundance in the coastal belt. Trees of the same variety are frequently found in groups in the soils favourable to their development and then 6 or 8 per acre may be reckoned upon. The number of trees that can be worked now in Northern Menabe is estimated to be about 6000, which would yield for that region about 30 tons of oil seeds; by the European methods, these would produce about 1650 gallons of oil.

RUBBER, GUM AND RESIN PLANTS

257 - Tests of African Rubber.

BREUIL, PIERRE. Essais de caoutchouc d'Afrique. — *Le Caoutchouc et la Gutta Percha*, Year 10, No. 107, pp 6884—6891. Paris, January 15. 1912.

This article gives the result of comparative tests of some samples of Funtumia rubber and the so-called "caoutchouc des herbes" (1) with Para Weak. As a test of the general value of rubbers, the writer took half the product of the tension strain resulting from the multiplication of this strain by the amount of elongation at the moment of rupture, He found that in Funtumia rubber vulcanised with 4.7 per cent. of sulphur, the pliability diminishes with the increase of the time of vulcanization, its "cyclic fatigue" increases (2), as do its resistance to rupture its stretching, and its permanent elongation. After being boiled for 90 minutes at 143° C. it is 1 ½ times more supple than Para, and becomes more elastic and a little less than twice less resistant than Para.

The "caoutchouc des herbes" becomes more supple, less cohesive and more extensible than Para rubber. It improves in quality with the length of the vulcanizing process.

The time of vulcanizing has little influence on the suppleness, extensibility and even on the resistance of Para; and the short fatigue cycle of the latter is only about 1/6 of that of the before mentioned varieties.

The increase of the sulphur (mixtures of 6.9 per cent.) used in the vulcanizing process causes the two African varieties of rubber to resemble Para closely. It raises the general value even of Para; Funtumia becomes worth 2/3 instead of 1/3 of the value of Para, while "caoutchouc des herbes" is worth 1/3.

The writer lays stress upon the arbitrary nature of the tests he has chosen for his determinations and upon the fact that the superiority in use of one rubber over another must not be deduced from his conclusions. The uses of Congo rubbers are different from those of Para; the former are preferred for the manufacture of certain articles on account of their softness. These experiments, on the other hand, show that it is necessary in the case of every kind of rubber to ascertain the optimum condition of vulcanization and, to this end, the conscientious investigator must make many experiments under varying conditions.

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(1) The name "caoutchouc des herbes" is given to rubber extracted from the rhizomes of *Carpodinus lanceolatus, Landolphia Henriquesiana Clitandra*, etc. (*Ed.*).

(2) The writer uses the term "cyclic fatigue" for the percentage elongation under a weight shown by samples of rubber after 5 cycles, or successive applications of equal tension. (*Ed.*).

258 - **Rubber in the Philippines.**

1. The Philippine Rubber Planting Industry.

2. ARTHUR, RICHARD. Rubber-Growing in the Philippines.

— *The India Rubber World*, Vol. XLVII, No. 3, pp. 139-141. New York, December 1, 1912.

1. — Government Commissioner of the Moro Province of the Philippine Islands estimates that the total area under rubber in the Philippines is about 6000 acres, of which about 3000 are in the province of Moro, 2500 in Mindoro and 500 in other provinces. On the other hand, the official estimate of the Director of Agriculture places the area in promising rubber trees (approaching the bearing state) at about 1250 acres. The bulk of the planting has been done since 1909. At first Hevea, Ceara (*Manihot Glaziovii*) and Castilloa were tried, but hundreds of thousands of Ceara seedlings have failed to grow owing to drought or other reasons. Only Parà rubber is now considered of value on the plantations and it is estimated that 90 per cent. of the acreage at present planted is in that variety. In most cases Ceara and Castilloa have been abandoned, owing to their inability to withstand droughts and strong winds and their variability in yield of latex.

The following figures of the cost of production have been estimated by the Moro Province Government.

	Cost of bringing into cultivation an acre of new land				Costs of upkeep per acre			
	$	£	*s*	*d*	$	£	*s*	*d*
Moro Province	50.94	10	9	3	18	3	14	0
Sumatra	73.60	15	2	5	20	4	2	2
Java.	109.94	22	11	10	23	4	14	6
Malay States	—	—	—	—	29	5	19	2
Straits Settlements . . .	137.42	28	2	10	—	—	—	—

It is claimed that in the Moro Province an acre of Parà rubber can be brought into bearing (fifth year) for $100, covering all charges, including cost of land;

Rubber is usually planted from 100 to 150 trees per acre, Five-year-old rubber trees have averaged three-quarters of a pound per tree; this brings the cost per pound of dry rubber, ready for shipment, to 33 cents (1*s* 4*d*) per pound, which can be reduced, as the yield increases with age. Native labor is procurable at 20 to 30 cents (10*d* to 1*s* 3*d*) per day. Although Philippine rubber has up to the present only entered the American market on a very limited scale, it has been favorably received in Europe, particularly in Hamburg and London, where in May 1910 it realized $2.63 (10s 10d) per lb. and has ever since commanded the top price.

2. — Besides having published numerous technical articles on the rubber industry of the Philippines, the Bureau of Agriculture in the Philippines has arranged to distribute some 50 000 Parà seedlings; these young plants will be carefully watched by the Bureau until well established. It is believed that no fungus diseases have been introduced into

the Philippines along with the seeds, which were obtained from Malaya. Naarly all districts of the Philippines, with the exception of Mindanao and some of the southern islands, are subjected to a dry season, but the Bureau of Agriculture believes that in many otherwise unfavorable localities the soil about the roots of the young seedlings can be kept sufficiently cool by the new system of leguminous «blanket crops», thus preventing injurious packing and baking by the sun.

259 - The Vitality of Hevea Seeds.

WILDEMAN, E. DE. Vitalité des Graines de l'Hevea. — *Le Caoutchouc et la Guttapercha,* Year 9, No. 106, pp. 6776-6780. Paris, December 15, 1912.

After having given a summary of the experiments of Mr. F. G. Spring, Superintendent of the plantations of the Federated Malay States on the vitality and germinating property of Hevea seeds the writer makes the following observations.

According to Mr. Spring's experiments, of which the results are reproduced in the tables given later, it appears that 50 per cent. more of the seeds of untapped than of tapped Hevea trees germinate. It is an interesting fact that these experiments, while reversing the conclusions reached in 1908 in the *Circulars and Agricultural Journal of the Royal Botanic Gardens, Ceylon,* confirm the statement that the seeds of untapped trees are, on an average, 10.7 per cent. heavier than those of tapped trees of the same age.

To preserve the germinating property of Hevea seeds various methods of covering them have been used; Mr. Spring has made experiments as to their relative efficiency. The results show that the highest germination percentage is obtained by using either seeds from untapped Para rubber trees, or seeds from tapped trees, which have been envelopped in wax.

The writer of this article states that the necessity of knowing beforehand the value of the plants to be raised, and the need for regulating selection, are reasons for prefering the seed of tapped trees, while Mr. Spring's experiments show the value of covering the seeds with wax. This is, however, costly; but if the seeds have to be subjected to a journey, of over 45 days, the number of plants obtained from seeds thus treated will repary the expense incurred.

On the other hand, the experiments on the germinating property of seeds of tapped Hevea should be continued, to determine whether the germination percentage diminishes with the number of years tapping has been continued. Should this prove to be the case, which is probable, seed for sowing purposes should be selected from trees which have been seldom tapped, but yet often enough to afford some criterion of their economic value. Thus there remain to be made a number of experiments, whose results will be of great importance to the future of the plantations.

The following tables give the results of Mr. Spring's experiments:

I. *Germination percentage of seeds from tapped and untapped trees.*

	Number of seeds per box	Duration of experiment	Number of plants from seed from trees		Percentage of germinated Seeds of trees	
			tapped	untapped	tapped	untapped
1	200	3 weeks	67	156	33	78
2	200	5 »	46	133	23	66
3	200	7 »	48	100	24	50
4	200	8 »	40	167	20	83
5	200	9 »	40	164	20	82
6	200	10 »	40	165	20	82

II. *Germinatiou percentage of seeds of tapped "Hevea" trees, untreated and enveloped in wax and in paraffin.*

	Number of seeds per box	Duration of experiment	Number of plants obtained		Germination percentage		
			Wax	paraffin	wax	paraffin	untreated
1	180	3 weeks	107	62	59	34	33
2	180	5 »	108	71	60	40	23
3	180	7 »	94	74	52	41	24
4	180	8 »	82	66	45	37	20
5	180	9 »	100	61	55	34	20
6	180	10 »	86	58	47	32	20

260 - **Recent Studies on the Production of Natural Camphor.**

BAILLAUD, E. Précisions nouvelles sur l'exploitation du camphrier. — *Journal d'Agriculture Tropicale*, Year 12, No. 138, pp. 362-367. Paris, December 31, 1912.

The writer had already mentioned in the *Journal d'Agriculture Tropicale* for June 30, 1912, the results obtained by growing the camphor tree in the United States and in South Africa; he now gives a short summary of the papers which have appeared more recently. The most important contribution is Mr. B. J. Eaton's study published as *Bulletin No. 15 of the Federated Malay States* in February 1912. This article contains an apparently complete bibliography of the works published on camphor (1), and a short review of the results obtained from camphor-growing in different part of the world.

The first experiments in the Malay States date from seven years back and, after five years, the trees were in as good condition as those of the same age in Japan.

According to Mr. Spring. the present Superintendent of the Experimental Plantations of the Malay States, the best method of propagating *Cinnamomum Camphora* is still by purchasing two-year-old plants from Japan, as experiments with seed and slips have proved unsatisfactory.

With regard to cutting, Mr. Eaton recommends beginning in the third year. An acre containing 700 three-year-old camphor trees gives annually in three cuttings 180 lbs. of camphor.

The distillation experiments have led to the following conclusions:

a) A yield of about 1 per cent. of camphor and of oil consisting chiefly of camphor can be obtained from the leaves and branches of trees of five years of age and perhaps younger.

b) The time of distillation ought not to exceed three hours in the case of the leaves of young branches.

c) The proportion of camphor obtained from the leaves is greater than that yielded by the branches, and the yield of the small shoots is more than that of the older branches of trees of the same age.

d) Drying in the open air has no bad effect upon the yield, but this would probably not be the case if the leaves were exposed to the direct rays of the tropical sun.

The camphor tree seems to grow well in the Malay States in relatively poor laterite soils, provided they are well drained. These results agree with those obtained in the United States, the Union of South Africa (2), and British East Africa; consequently it seems clear that the true camphor tree can be grown in all countries with a tropical or subtropical climate.

In Formosa also, the "Bureau des industries productives" is going to start regular plantations in 1913-1914; these should provide for an annual production of about 3000 tons of camphor and a like amount of oil. An improved apparatus has been installed, allowing of 48 per cent. by weight of camphor being obtained from the oil treated.

China appears about to take an important place in camphor production, since the Chinese traders now go into the interior as well as the valleys of the coast, and the export trade from the Northern ports is continually increasing.

But besides the camphor tree of Japan, other trees are used as sources of natural camphor. In the first place should be mentioned *Blumea bal-*

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(1) An important contribution to the bibliography of camphor is made by Prof. ITALO GIGLIOLI, in his work entitled *La canfora italiana*. Roma, 1908 (*Ed.*).

(2) Warner in the *South African Agricultural Journal* of January 1912. (*Ed.*).

samifera, recorded in Tonkin in 1897 by Mr. Morice, and called by the Annamites "dai-bi". According to M. Lan, 400 lbs. of leaves produce 1 lb. of "bang-phien", which is the camphor-like substance obtained.

In Burma, it is cultivated for local consumption, but the Forestry Service, while demonstrating that *Cinnamomum Camphora* can be grown in that country with success, is also making preparations for the cultivation of *Blumea balsamifera*.

Some researches have been made on *Dryobalanops Camphora*; this tree supplies borneol, of which the neighbourhood of Sumatra furnishes about 220 lbs. annually; it has been ascertained that the Borneo camphor is only formed in the crevices formed in *Dryobalanops* by a beetle grub which has not yet been determined.

The linalool, obtained from a species of camphor tree called "shu-sho-bohu", can also be extracted from real camphor oil.

Rosemary is also mentioned as a plant which may assist in the production of true camphor, as its oil gives 8 to 10 per cent. of a mixture of camphor and borneol; from the preponderance of the former it could be used directly without recourse to chemical transformation. Laboratory experiments appear also to have been started in certain large French factories.

261 - Experiments on Manuring Tobacco in Hungary.

VARIOUS CROPS

KERPELY, KÁLMÁN. Dohánytrágyázási kisérletek. — *Dohány Njság*, Year XXX, No. 2, pp. 2-4. Budapest, January 20, 1913.

Experiments begun in 1897 by the writer, Director of the Royal Hungarian Experiment Station for Tobacco Cultivation at Debreczen, in 8 plots of sandy soil to which from this date no manure was applied for 13 successive years, in order that the effect of the manures subsequently spread on the exhausted soil might be studied.

The yield of the tobacco grown during this time diminished in quantity and deteriorated more and more every year. While during the first few years the crop of "Szeged" varied from 1850 lbs. to 2 000 lbs. per acre, in 1909 it was only 960 lbs. The analysis of the soil showed that, during these 13 years, the loss of nitrogen and lime had been greater than that of potash or phosphates.

Finally in 1910, the application of chemical manures began. Owing to the special nature of the experiments, a larger quantity of manure than usual was used per acre, *viz.* 390 lbs. of 18 per cent. superphosphate, the same amount of 40 per cent. potash and 530 lbs. of nitrate of soda; the two first were applied at the beginning of February and the last in two parts, after the first and the second hoeing. When, as in 1910, the rainfall is abundant, a satisfactory result can be confidently expected.

The following table gives the distribution of the various manures, the yields, and the combustibility of the tobacco before and after fermentation.

Plots	Manures	Amount of manure per acre	Yield per acre	Excess over control	Combustibility of leaves per second	
					Before fermentation	After fermentation
		lbs.	lbs.	lbs.	seconds	seconds
1	Control (no manure for the 13 preceding years)	—	998	—	23	31
2	Farmyard manure	46 350	1485	487	18	23
3	18 % superphosphate	390	1044	46	21	36
4	40 % potash salts	390	1176	178	29	42
5	Nitrate of soda	530	1632	634	16	27
6	18 % superphosphate	390	1300	302	32	48
	40 % potash salts	390				
7	18 % superphosphate	390	1795	797	22	34
	40 % potash salts	390				
	Nitrate of soda	530				
8	18 % superphosphate	390	2110	1112	21	29
	40 % potash salts	390				
	Nitrate of soda	530				
	Lime from sugar factories	15 400				

The conclusions reached are:

The tobacco grown on the control plot showed a very feeble condition of development; its thin light-green leaves, 8 on a stem, manifested the characteristic signs of want of nitrogen. It was deficiency in nitrogen that had reduced the yield; this was clearly seen from the plants which hed been given nitiate of soda, whose much larger, thick dark green leaves, 12 on the stem, developed normally, while superphosphate and potash, whether used together or separately, had only a secondary effect on increasing the crop. In fact, the excess of plot 6 over the control was 302 lbs., while that of plot 7 was 797 lbs. The fertilizing effect of the lime used with the superphosphate, potash and nitrate (plot 8) should also be noticed; this was shown by a yield superior to that obtained from any other plot. This effect is explained by the impoverishment of the experiment soil during the period of 13 years, when the lime content decreased from 0.207 per cent. to 0.112 per cent.

It was further shown that, thanks to the application of nitrate, a more valuable and resistant substance was obtained, and though the combustibility of the leaves was less than when other manures were employed, yet a fine ash was obtained.

The Experimental Station will continue its experiments; every three years a mixture of farmyard manure and lime will be applied, other manures being added every year, with the view of observing the effects due to the application of an excessive amount of manures during a prolonged period of time.

262 - The Anatomy of "Jequirity" (Seed of *Abrus precatorius*) and of the Seeds commonly used as Adulterants.

BARIOLA, ROSA. Sull'anatomia del "Jequirity" (seme dell'*Abrus precatorius*) e dei semi delle piante comunemente usate per sofisticarlo. — *Atti della Reale Accademia dei Lincei*, Year CCCIX, Series V, Rendiconti, Vol. XXI, Part 12, pp. 859-863. Rome, December 15, 1912.

This is an anatomical and microchemical study of the seeds and medicinal powders of *Abrus precatorius* L. and of those of other Leguminosae with which they may be confused or fraudulently mixed, namely the seeds of *Rhynchosia precatoria* or *phaseoloides* D. C.; of *Adenanthera pavonina* L.; and of *Ormosia dasycarpa* Jacks.

MARKET GARDENING

263 - The Naples Tomato.

ZACHAREWICZ, ED. La Tomate de Naples. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 997, pp. 117-119. Paris, January 23, 1913

The variety known as the "Naples Tomato" is much cultivated in the neighbourhood of the city of Naples. The fruit is exported in large quantities to the German markets, where it is much prized for its size, rounded shape, smooth skin, colour, fragrance, and firmness. The plants are strong, productive and disease-resistant.

The writer made experiments in two market gardens in the neighbourhood of Avignon (Vaucluse) where the soil is formed of the recent alluvium of the Durance, and is a marl rich in nitrogen and phosphoric acid and containing a fair amount of potash. The "second early" system of cultivation was adopted, as is usual in the district; that is to say the plants are forced half the time in frames and then planted out. The amount of manure used per acre wes as follows: farmyard manure, 14 tons; sulphate of ammonia, 180 lbs; sulphate of potash, 180 lbs.; 18 per cent. superphosphate, 360 lbs. Two applications of soap mixture and two of Bordeaux mixture were made.

It was shown that the Naples variety possesses all the above-mentioned qualities; and it is so suitable for export that it fetches 10*d* per cwt. more than the other tomatoes on the market.

Further, Naples tomatoes are more productive than the local varieties (18, 20 and 22 lbs. per plant in each of the two market gardens, as against 13 to 15 ½ lbs. for the Rochefort variety).

The writer therefore recommends the cultivation of the Naples variety, which will find a ready sale in a district where the exports of fruit increase every year.

264 - The Kerguelen Cabbage.

POISSON, H. Le Chou de Kerguelen. — *Revue Horticole*, Year 85, No. 1, pp. 14-15. Paris, January 1, 1913

The Kerguelen cabbage (*Pringlea antiscorbutica*, R. Br.) is a native of Kerguelen and the adjacent islets. It has a stalk 28 inches high and its root is 6 inches in length. At the top of the stalk is found the cabbage-head; this is composed of green leaves with well developed central veins and secondary veins similar to those of European cabbage; the outer leaves droop; the succeeding ones, which are yellowed, and inside white, form a compact "ox-heart" 10 in. high and 12 in. broad. Around the head and on the stalk grow the floral spikes, which are 3 ft. high, the flower-bearing portion reaching a height of 16 in. and bearing 100 to 150 flowers. The fruit is a siliqua about 2 in. long by half an inch broad. The seed, which is white and irregularly triangular, is 4 mm. long and from 2 to 3 wide at the base.

Pringlea antiscorbutica is a valuable plant in cold countries, being used, like many other Cruciferae, as a preventive of scurvy. Further, it is an article of food; the heart can be eaten raw or made into salad, and the pith of the stem is edible, its taste much resembling horse-radish.

Finally, the seed is eaten raw and tastes like hemp-seed or maize-flour; as each inflorescence bears 100 to 150 flowers and there are about 50 seeds to a fruit, this makes from 5000 to 7500 seeds on an inflorescence.

This plant requires, when cultivated, a rather light and ferruginous soil, such as results from the decomposition of basalts; it must also contain some salt. It seems worth while acclimatizing this cabbage in the cold countries of the north, where it would be a great resource for the inhabitants and their domestic animals. But even if it could be grown in temperate zones, *Pringlea antiscorbutica* would there chiefly serve as an object of curiosity.

265 - A Substitute for Flower-pots: Tubes of Giant Reed (*Arundo Donax*).

PÉREZ, GEORGES V. Pour remplacer les pots: Tubes de roseau de Provence (*Arundo Donax*). — *Journal de la Société Nationale d'Horticulture de France*, Year IV, Vol. XIII, pp. 717-718. Paris, November 1912.

For a long time past, in Australia and at the Cape of Good Hope, tubes formed by pieces of stalk of the giant reed (*Arundo Donax*) have been used for large plantations of various kinds of acacias as well as for the multiplication of Eucalyptus. These tubes occupy less space and are less fragile than the usual flower-pots; they allow hundreds of plants to be kept for months while waiting for the favourable moment for planting out. They offer also great advantages for transport over long distances and for reafforesting dry soils.

The writer has employed this system to advantage for the last dozen years; he has thus been able to obtain in two months rooted cuttings of *Atriplex nummularia* by introducing into the tubes herbaceous cuttings instead of seeds. In order to use these cuttings the only thing to be done is to make a hole in the ground and place a tube containing a plant into it.

The writer has no doubt that in desert, sandy and even salt soils, wonders may be achieved with this system in the production of valuable pastures.

FRUIT-GROWING

266 - **Manures for Vines.**

LABERGERIE. Fertilisants pour la vigne. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 995, pp. 33-36. Paris, January 9, 1913.

Experiments with different manures were made in 1912 in the vineyards of Fontliasmes and they will be repeated for three consecutive years. All the manures were spread before the first spring ploughing.

The soils of the Fontliasmes vineyards are remarkable for their deficiency in lime. Many analyses of the different plots of ground have been made, and the figures obtained have in every case been very similar to the averages given below. The only factor which varies appreciably is the compactness of the soil, depending on its clay content. Fine soil, 76.40 per cent.; calcareous stones, none; siliceous stones, 23.60 per cent. In every 100 parts of fine soil there are: sand, 92-80; clay, 5-17; lime, traces; humus, 0.20; nitrogen, 0.14; phosphoric acid, 0.05; potash, 0.096; lime, 0.20; magnesia, 0.30; water and substances soluble in acidulated water, 2.014.

Weight per acre, calculated on 0.14 *(one-seventh) acre.*
Experiment with sulphate of potash at 2.4 *cwt. per acre.*

Plots and their situation; nature of the soil		Number of bunches	Weight of bunches		Yield of must	
			average	total	%	Total
			lbs.	lbs.		gallons
I: west part; a little injured by hail Loam, fairly compact, cold.	without potash	28 700	0.238	6 840	63	427
	with potash	36 300	0.251	9 132	66	601
I: east part; untouched by hail. Loam, stony, dry, warm.	without potash	33 200	0.222	7 478	60	441
	with potash	26 700	0.255	6 830	68	463
II: all slightly hurt by hail; west part. Loam, very compact, cold.	without potash	30 750	0.198	6 191	55	338
	with potash	31 600	0.209	6 610	57	374
II: east part. Loam, compact, cold.	without potash	32 000	0.220	7 048	60	422
	with potash	32 000	0 242	7 761	64	494

Experiments with manures containing manganese.

Plots and their situation; nature of the soil; manures used		Number of bunches	Weight of bunches		Yield of must	
			Average	Total	%	Total
			lbs.	lbs.		gallons
Manganese at 1.6 cwt. per acre.						
I: west part; a little injured by hail. Loam, fairly compact, cold.	Without manganese . . .	25 700	0.211	5440	57	312
	With manganese	31 850	0.220	7020	60	418
I: east part; untouched by hail. Loam, stony, dry, warm.	Without manganese.	33 200	0.273	9070	72	650
	With manganese	30 750	0.284	8830	74	650
Lime and manganese at 1.6 cwt. per acre.						
II: all slightly injured by hail; west part. Loam, very compact, cold.	Without lime and manganese	27 500	0.202	5575	56	312
	With lime and manganese. .	29 950	0.220	6600	60	392
II: east part. Loam, compact, cold.	Without lime and manganese	30 350	0.216	6560	59	387
	With lime and manganese. .	31 600	0.231	7315	62	454
Sulphate of manganese at 0.4 cwt. per acre.						
I: west part; a little injured by hail. Loam, fairly compact, cold.	Without sulphate of manganese	27 700	0.233	6470	62	401
	With sulphate of manganese.	28 700	0.246	7090	65	463
I: east part; untouched by hail. Loam, stony, dry, warm.	Without sulphate of manganese	28 100	0.288	8110	75	605
	With sulphate of manganese.	30 550	0.290	8885	76	677

Each experimental plot consisted of 50 ares (1.23 acre) selected in the middle of a hectare (2.47 acres) in such a manner as to leave a control portion at either end, which was unmanured. The vine used was without exception the Folle Blanche des Charentes.

The results of numerous previous experiments had shown that the yield in must increased with the weight of the grapes. In a good season, when the fruit ripens normally, the average weight of the bunch of grapes in Fontliasmes vineyards for Folle Blanche is 125 gr. and the must yield is from 73 to 75 per cent. The above tables have been drawn up according to the weights obtained every year from 1901 to 1908. The figures must not be taken absolutely, for they depend to some extent upon the degree of ripeness of the fruit. When the average weight of a bunch of Folle Blanche grapes is 135 gr., the average must yield (weight) will be 77 per cent.; for 130 gr., 75 per cent.; 125 gr., 73 per cent.; 120 gr., 70 per cent; 115 gr., 67 per cent.; 110 gr., 64 per cent.; 100 gr., 60 per cent.; 95 gr., 57 per cent.; 90 gr., 55 per cent.

In each plot 6 ares (0.14 acre) at each end, *i. e.* 12 ares in all, were the subject of comparative verification with adjoining areas of the same size on the control plot; the bunches gathered from all this area were counted and weighed; the average bunch-weight and the must yield were ascertained.

The sugar content of the juice from each plot was tested by means of a mustometer, but the data are inaccurate owing to the very bad weather which prevailed during the vintage of the plots used for verification of the results.

From certain observations due to cultural accidents, the above figures were furnished by the verifications.

The influence of electricity. — Experiments in obtaining electricity from the atmosphere have been attempted, using metal rods, to test the action of the current. Iron rods ¼ in. in diameter and provided with a rounded end of copper attached by screws were employed. The rods, which varied in height, ware spaced at double the distance of their height above the ground, and kept in a vertical position by supports of wood. They were inserted in the soil to a depth of about 6 in. and a length of 20 to 24 in. was placed horizontally below the ground. The results for the short rods (6 ft. 6 in.) and the long rods (11 ft. 6 in.) were exactly of the same nature.

They are given in the following table:

Plots and their situation; nature of the soil		Number of bunches	Weight of bunches		Yield of must	
			average	Total	%	Total
			lbs.	lbs.		gallons
I: west part; a little injured by hail. Loam, fairly compact, cold.	Without rods	9 950	0.284	2 830	74	205
	With rods	13 300	0.246	3 277	65	214
I: east part; untouched by hail. Loam, stony, dry, warm.	Without rods	15 600	0.220	3 435	60	205
	With rods	14 300	0.240	3 479	63	214

The following figures are the averages of those given above (rounded off):

	Experiments with sulphate of potash.				
With	31 650	0.240	7 580	64	480
Without	31 150	0.220	6 870	60	410
	Experiments with carbonate of manganese.				
With	31 100	0.240	7 440	64	543
Without	29 200	0.224	6 660	61	414
	Experiments with sulphate of manganese.				
With	29 650	0.268	7 990	70	570
Without	27 900	0.260	7 290	68	499
	Experiments with atmospheric electricity.				
With conducting rods	13 800	0.264	3 350	64	214
Without conducting rods	12 750	0.253	3 130	67	205

The potash manures gave an increase in the net return of about 15 per cent. and the manures containing manganese an increase of about 13 per cent.; the chief action in the latter case is attributable to the lime and manganese, which seems quite natural, given the small amount of lime present in the soils experimented upon. The differences in the total weight of the yields are as a rule unimportant, but what is constant (except in the case of a plot furnished with metal rods) and remarkable, is the increase in the average weight of the bunch under the influence of the different manures used, and also as a result the increase in the must yields.

267 – The Cultivation of Mulberry Trees in Madagascar.

FAUCHÈRE. La culture du Mûrier au Madagascar. — *Bulletin Economique du Madagascar*, Year XII, No. 2, pp. 19-38. Tananarive, 2nd Half - year, 1912.

It is well known now that all the forms of mulberries that are met with in the Madagascar plantations belong to the species *Morus alba* and it is probable that it is the same white mulberry that forms all the mulberry groves of Asia. But the mulberry is a tree extremely subject to variations and in the Madagascar plantations alone there are at least 20 or 30 forms of a mulberry called Malagasy or native mulberry. They are far from having all the same value, and it is indispensable to multiply only the most vigorous and productive kinds, all the more so as those which produce the most abundant and most developed leaves are also those least subject to the disease known as "leaf mildew". Besides the native mulberry, which Prof. Cornu considered as a variety *indica* of *M. alba*, other varieties have been introduced since the French occupation, among others the Philippine mulberry or *multicaulis*, which has succeeded perfectly in the Madagascar plantations, and which has the advantage of being very early and of producing leaves very soon.

A subvariety of this mulberry, the Lou mulberry, seems to suit more especially the high parts of Vakinankaratra where frosts are to be feared during the first fortnight of September, as it is a very late form, the leaves not beginning to appear till the end of that month. Another variety that it would be advantageous to import is the Tonking mulberry, which, grown as shrub, would give leaves almost throughout the year.

Climate. — The mulberry finds in the whole island a suitable climate, and while it is true that in the parts situated above 4500 feet the September frosts cause serious damage to the trees, yet they never endanger their life. On the west coast mulberries thrive very well, as well as at Diego Suarez, Tamatave and Fort Dauphin. The east winds retard the vegetation, so that if early leaves are required the trees must be protected against the wind.

Soil. — The deep and moist alluvial soils along the river courses in Madagascar, as well as the volcanic soils, suit the mulberry admirably; while compact and swampy soils in which moisture stagnates are unfavourable; nevertheless in very moist soils mulberries grow very well after efficient drainage.

Multiplication. — The multiplication by cuttings is extremely easy in a warm moist climate like that of certain districts of Madagascar. In tropical countries therefore cuttings of either herbaceous or lignified branches may be used.

For cuttings of lignified branches, one-year-old branches about a finger thick are adopted. The soundest and best developed ones are selected and either planted at once where the tree is to grow or put into a nursery; the latter method is preferable for the centre of Madagascar, where long periods of drought prevail. For this reason the best moment to stock the nursery is between July 15 and August 15, a time that corresponds to spring in Europe.

The best time for multiplication by herbaceous cuttings is the rainy season between the end of December and the first fortnight of February; the herbaceous extremities of healthy branches are taken from the most vigorous mulberries and they are planted directly where the tree is to stand; it is useful also to mulch the soil with grasses after planting the cuttings. On the east coast and in the forest regions all the precautions which are needed in the centre and on the western slope are almost unnecessary, and multiplication by cuttings can be done easily at any time of the year.

It is not advisable to waste time in multiplying mulberries by means of seed; as for grafting, it does not present any difficulty. Cleft grafting is practised at the moment when vegetation reawakens, that is, for the centre of Madagascar, at the end of July and the beginning of August. Crown grafting is performed during the course of vegetation, from October to March in the centre of Madagascar, and no doubt in the whole southern hemisphere.

The best time for shield-grafting mulberries is from September 15 to March 15; but it is not impossible that on the east coast shield and crown grafting may be carried out during the whole year, as the mulberries are in continuous vegetation.

Selection of the site of a mulberry plantation. — The natural conditions of the island do not always allow of an easy choice of the soils having all the desired requisites, and one must often put up with medium soils; still, if plenty of manure is available, the mulberries may be planted anywhere. At the Namisana Station mulberry groves have been planted in very dry soils consisting of extremely poor laterite and the trees behave very well; it is true that the plantations have been very carefully prepared and their soils vastly improved with the refuse from Antananarivo.

Preparation of the soil and planting. — Breaking up the soil and digging the holes for planting must be done during the rainy season or during the two following months, because when the soil is dry these works cost twice as much. In rice-fields or in alluvial soil, breaking up the soil does not appear to be necessary, as these soils are generally sufficiently loose. In the centre of Madagascar planting out must be done during the rainy season; it presents no difficulty. If a plantation is made during the dry season, resort must be had to irrigation or at least to abundant watering after planting.

Distance between the trees and shapes to be given to the trees. — The distance to be kept between the trees varies considerably, according to the kind of cultivation adopted and to the fertility of the soil.

Mulberries may be grown as hedges, dwarfs, half-standards and standards. As hedges they produce leaf very soon, especially in warm and moist climates; the drawback is that the hedges require a great number of plants or of cuttings. The writer advises the silk growers of Madagascar to grow dwarfs and half-standards not above 3 or 4 ft. high. In plantations such trees must be placed at about 10 ft. from each other.

The trees are preferably shaped in the nursery; half-standards require about three years, while dwarfs form their stems in one year.

Upkeep. — The successive cultivation of mulberries consists of hoeing once or twice a year, manuring, pruning and the control of insects.

In the centre of Madagascar it is generally sufficient to hoe twice a year; green manures such as pigeon pea and Réunion mimosa are recommended, as they introduce into the soil a certain amount of moisture besides plant food. Pruning presents no difficulties in tropical countries; it is indispensable every year for the hedges, and consists in cutting back the branches of the year to 4 or 6 inches from the soil.

Duration and yield of mulberry plantations. — It is not yet known up to what age mulberry trees produce satisfactory leaf crops, but judging from the specimens which grow freely near certain villages in the centre of Madagascar it is reasonable to suppose that they will continue to produce leaves for several decades. Grown as hedges it is generally necessary to replace them after five or six years.

The leaves may be gathered, according to the writer, twice a year from the same tree under the climate of Antananarivo; three crops might be obtained where the soil is very fertile, and on the east coast it would be possible to have four or even five crops without endangering the existence of the trees.

As for the returns, no exact figures are available; nevertheless the results obtained at Nanisana warrant the belief that a plantation of mulberries grown as hedges under the best conditions yields in two crops 64 to 80 cwt. of leaves per acre.

Pests. — The insect which causes most damage to mulberries in Madagascar is a kind of scale, doubtless related to *Diaspis pentagona,* and controlled in the same way as this. Other pests of mulberries are : *Callimatium venustum,* a longicorn about $^{4}/_{5}$ of an inch long ; the "fanetribe", a large bug : and the "fovato", a weevil known as *Alcides excavatus.* The only injurious fungus is a leaf-mildew, named by M. Delacroix *Ovulariopsis moricola,* which is controlled by selecting the large-leaved varieties and by keeping the soil of the plantations in a good state of fertility.

268 – Production of a New Variety of Cherry by Shield-Budding.

PAELINCK, F. in *La Tribune Horticole* quoted by BOIS, D. and GRIGNAN, G. T. : L'influence du sujet sur le greffon. — *Revue Horticole,* Year 85, No. 2, pp. 27-28. Paris, January 16, 1913.

About ten years ago, at Swynaerde, near Ghent, an Early Rivers cherry was shield-budded on a Mahaleb stock near the base. The operation was performed in August, and proved quite successful, the stock being cut back the following spring. After four years the first crop of fruit was obtained, and the cherries borne by the new tree were of a yellowish-white colour instead of dark red like those of the parent tree, the crop moreover being a week later in ripening. A shoot of this new variety was then grafted on to a wild cherry (*Prunus avium*) in order to see whether it would revert to its original condition ; however, the fruit on the fresh stock retained the characters of the new variety, *i. e.* loss of colour and of early maturity.

269 – Citrus Growing in Rhodesia.

The Rhodesia Agricultural Journal, Vol. X, No. 2, pp 216-220. Salisbury, Rhodesia, December 1912.

The Mazoe Citrus Syndicate was formed in 1909 and is now farming 9000 acres near the junction of the Tatagura and Mazoe Rivers. Theirs is the first organised effort to grow citrus fruits on approved lines in Rhodesia, and there is every reason to believe that the country is eminently adapted to the culture ; the fact that the fruit ripens there during the dry season, and can therefore be put on the home market at a season when there is little competition from other sources, is a great advantage.

A grove of 1000 trees of the Washington Navel Orange, budded about 4 in. from the ground on the native wild lemon stock, was planted in February 1910, the buds being then two years old. A second thousand were planted in December 1911, the buds being then one year old. The average measurements of these trees at present are :

	Height ft. in.	Circumference of spread of top ft. in.	Circumference of stock at union in.
Planted in 1910	6 1	2 7	6¼
" " 1911	4 0	6 6	4½

Another grove, of 2 000 Navel trees, 28 Satsumas, 58 Valentias, and 10 lemons, was planted three years ago on high rocky ground and is also doing very well. There is a large nursery stock, all on the native wild lemon and a further 3 000 trees are to be planted out during the present wet season.

The slight frosts encountered have not injured the trees, but are likely to be beneficial to the fruit by sweetening it and improving the quality. So far no fertilizers or manure have been employed, neither has irrigation been practised ; but as it is desirable to make provision for the application of water in exceptionally dry seasons, or even in ordinary dry seasons if yield and quality are thereby improved, the Syndicate is now engaged on an irrigation scheme which will probably be operating next dry season.

270 - Cacao Manuring Experiments in Dominica.

TEMPANY, H. A. in *Report on the Agricultural Department, Dominica* 1911-12, pp. 20-29. Barbados, 1912.

In 1900, an acre and a half of a 10-year-old cacao plantation was laid out at the Botanic Station and divided into five plots, each of which has received a different manurial treatment applied annually from 1902 to 1912. The following are the average returns for the period :

Number of Plot	Manurial Treatment: cwt. per acre	Wet cacao: lbs. per acre	Dry cacao: * lbs. per acre	Cost of manuring: per acre	Net gain ** by manuring per acre
				s. d.	£ s. d.
1	No manure	2800	1176	—	—
2	Basic phosphate . . . . . . 4. Sulphate of potash . . . . 1 ½.	3369	1415	2 5 3	3 14 3
3	Dried blood . . . . 4.	3261	1370	1 16 0	3 1 0
4	Basic posphate . . . . 4. Sulphate of potash . . . . 1 ½. Dried blood . . . . 4.	3876	1628	4 1 3	7 4 9
5	Mulched with grass and leaves. .	4233	1778	3 0 0	12 1 0

* Calculated from the wet yield assuming 42 lbs. of cured cacao = 100 lbs. wet cacao.
** Taking the value of cured cacao at 6*d*. per lb.

The artificial manures are distributed over the surface of the ground and lightly raked in. The mulch consists chiefly of grass from lawns, and leaves and pods of the saman tree (*Pithecolobium Saman*), and is applied at the rate of 4 baskets of 20 lbs. each to every tree. No forking has been performed since the begining of the experiments.

The returns of the mulched plot have been uniformly highest, Plot 4 coming next in order, and in both these cases, the level of the yields was gradually increased during the first 5 or 6 years and then remained more or less stationary, fluctuating with the seasons. In the case of Plots 2 and 3, which receive incomplete dressings, and of Plot 1, with no manure, there has been no accumulation of fertility; but neither have the yields declined, though that may be expected to occur in future. The superiority of the treatment on Plot 5 is substantiated by the excellent appearance of the trees.

Two other experiments carried on at the Botanic Station during the years 1907-12 indicate: 1) that mulching is equally efficacious on a steeply sloping hillside and on the flat, and 2) that a mulch of grass and leaves is superior to an application of 600 lbs. per acre of cottonseed meal.

271 - New Experiments on the Cultivation of Walnut Trees.

FORESTRY

1. REBMANN. Neuere Erfahrungen uber die Anzucht einiger Juglandeen. — *Allgemeine Forst- und Jagd-Zeitung*, Year 88, pp. 257-272 + 1 fig. Frankfurt a. M., August 1912.
2. ID. Nachtrag zum Artikel "über Juglandeen" im August-Heft 1912. — *Ibid.*, pp. 401-403. December, 1912.
3. BRANDSTETTER, J. v. Zur Kultur von Juglans nigra. — *Oesterreichische Forst- und Jagd-Zeitung*, Year 31, No. 2, pp. 10-11. Vienna, January 10, 1913.
4. BEEVOR, Sir H. R. Oak and Black Walnut Plantation. — *Quarterly Journal of Forestry*, Vol. VII, No. 1, pp. 28-29. London, January 1913.
5. SOMERVILLE, W. Raising Black Walnuts. — *Ibid*, pp 32-33 + 1 fig.

There is no doubt that the walnuts *Juglans regia*, *J. nigra* and *J. cinerea* rank among the most valuable kinds of trees. But, notwithstanding the wide limits of the area on which they live, their numbers are diminishing in both Europe and North America, in consequence of the great demand for them not being made up for by their reproduction. Lately measures have been taken and experiments commenced in various countries in order to promote the cultivation of these precious trees, especially *J. regia* and *J. nigra*: in Austria-Hungary about 1890, in Prussia in 1903, and in Hesse, Baden and Bavaria; also in Switzerland and, as it appears, in England.

As basis to be adopted for the cultivation of the above walnuts the limits for *J. regia* may be considered to be between 44° and 52° N. and for *J. nigra* and *J. cinerea* still further north, as they are killed by frost only at - 37° C. (- 34° F).

As for the soil suitable for walnuts, there is no agreement among the several writers and practical men. According to some, especially for *J. regia*, a calcareous soil is considered necessary, whilst others do not share this opinion. The writer has made an enquiry which yielded the following interesting results. For a tree about 60 years old standing by itself the following diameter breast-high may be reckoned upon:

	Inches
Sandy soil	15½ to 17
Schist soil	19½ to 21½
Good sandy alluvial soil	21½ to 23½
Rock soil *in situ*	23½ to 25½
Calcareous soil, loam and loess	25½ to 27½

Anyhow, the finest development is met with on deep calcareous or loess soils ; so that it is believed that it is not so much the chemical composition of the soil as its physical properties such as depth, moisture, heat and aspect that have a special influence.

The most favourable localities are on hills, on the slopes of mountains and in spacious valleys. And what is said of *J. regia* holds good for the other two species, *J. nigra* and *J. cinerea*, with the difference that the two latter are much more exacting as to depth, looseness and moisture, and perhaps also as to the content in mineral substances.

The writer is of opinion that direct sowing is absolutely to be preferred to planting, provided that germination has taken place by the end of May. With this object he proposes the following method of sowing : the completely ripe fruit must be freed from its husk and dried so as to prevent the formation of moulds, after which the nuts of *J. nigra* and *cinerea* are placed in the ground in November at a depth of 2 ¼ to 2 ¾ inches, and at the rate of 6 or 7 thousand nuts on a few square yards. If cold is to be expected the soil should be covered with litter. The fruit of J. *regia* on the contrary is preserved in a dry place in sand or ashes and put into the ground in March. In order to facilitate germination, as the season opens, the ground may be covered with stable manure. As soon as the nuts have germinated and the shoots are 2 to 2 ½ inches long they are collected and planted in moist places. As for plantation, the best method would be planting them alone in clumps, at intervals of 5 feet or in belts with spaces of 4ft. 7 in. × 4 ft. or 3 ft. 7 in., or 4 ft. × 3 ft. 7 in. or 3 ft. 3 in. In plantations under covert the development is less rapid but more regular. On the mode of development the writer gives the following instructive tables.

I. *Height of plants in feet and inches :*

a) *in the open*

Species	1st.	5th.	7th.	10th.	15th year
J. nigra .	1 ft. 4 in.	8 ft. 8 in.	13 ft. 1 in.	19 ft. 4 in.	28 ft. 4 in.
J. regia .	10 in.	6 ft. 0 in.	9 ft. 3 in.	14 ft. 11 in.	23 ft. 11 in
J. cinerea.	7 in.	4 ft. 1 in.	8 ft. 4 in.	—	—

b) *under covert*

J. nigra	8 ½ in.	3 ft. 11 in.	5 ft. 8 in.
J. regia	8 in.	4 ft. 5 in.	7 ft. 0 in.
J. cinerea	3 in.	1 ft. 10 in.	4 ft. 1 in.

II. *Development at 76 to 79 years.*

Isolated, full crowned.	Diameter	25 to 36 inches ; average 28.7 inches. 263.4 cub. feet of wood.
At a distance of ¾ crown from each other.	Diameter	22 to 31 inches ; average 24.7 inches. 177.6 cub. feet of wood.
Dense, ½ crown.	Diameter	17 to 23 inches ; average 20 inches. 99.5 cub. feet of wood.
Crowded, ¼ crown.	Diameter	11 in. to 18.9 in.; average 14.9 in. 43 78 cub. ft. of wool.

Among subsequent operations hoeing is recommended, especially for isolated trees, and pruning both the lateral and frost-killed twigs, as well as the main ones when it is desired to limit the development in height.

In the management of walnuts it must be borne in mind that they behave very like oak trees respecting light and that consequently they require similar treatment and especially a thinning out at the age of twenty years.

Besides the production of walnuts by *J. regia*, which may be set down at an average of 2000 per tree in the full years, there is the production of wood. *J. nigra* may be estimated to yield at 80 years a final product corresponding to the normal product of oak trees of twice that age, namely 7945 cub. ft. per acre on first class soils; the production of *J. regia* and *J. cinerea* is somewhat less.

The writer gives the following values per cubic foot in south Germany:

		s	*d*
for logs measuring	47 to 57 inches in circumference	1	9½
,, ,,	59 to 69 ,, ,,	2	4¼
,, ,,	70 to 82 ,, ,,	2	11
,, ,,	82 in. and above	3	4

The writer admits the possibility of natural regeneration of *J. regia*, whilst it seems doubtful in the case of *J. nigra* and *J. cinerea*.

The following is a comparison between the cost of cultivation per acre of these walnuts and of oak.

Expenses on 126 *acres under walnuts.*

	£	*s*	*d*
1. Work of planting	277	8	9
2. 8272 lbs of nuts	90	12	0
3. Production of 56 500 one-year old seedlings	10	15	7
4. Interculture, I and II year	95	1	2
5. Surveillance	26	14	0
Total	£500	11	6
per acre	£3	19s.	5½*d.*

These calculations hold good for the period 1891-1910 and for Alsace. In general and under present conditions the outlay per acre and for 2630 plants of *J. nigra* and *J. cinerea* may be set down approximately as follows:

	£	*s*	*d*
1. Preparation of the soil in strips 4 ft. 8 in. wide	4	3	4
2. 2910 nuts		15	1
3. Sowing 3 ft. 8 in. apart		17	10
4. Weeding	1	3	7
Total	£ 6	19	10

The above outlay is reduced by about 6 shillings for *J. regia* owing to the lesser cost of the seed nuts.

The expenses for an acre under oak and for 2430 plants are about the following:

a) *Sowing.*

	£	s	d
1. Preparation of the soil in strips 4 ft. 8 in. wide	4	3	4
2. 16 ½ bushels of acorns		19	10
3. Sowing		17	10
4. Weeding		11	10
5. Surveillance	3	4	8
Total	£ 9	17	6

b) *Planting.*

	£	s	d
1. Preparation of the soil and planting out	5	7	1
2. 2430 oak saplings 5 to 6 years old	1	8	8
3. Cultivation and surveillance	1	3	10
Total	£ 7	19	7

The writer notes lastly that in order to judge surely the full forestal and financial bearing of a method of culture for a given kind of forest tree, about 30 years of experience are required.

3. — The above data agree in their general lines with the following practical rules, the result of many years' practice in a forest estate of Slavonia:

I. The soil should be a deep, somewhat clayey loam or moist alluvial soil containing humus.

II. The walnuts should be sown if possible with their husks and not deeper than 3 ¼ inches.

III. For planting, seedlings one or two years old at most to be used and their tap root cut cleanly at 12 inches.

IV. Mixing with other kinds of trees suitable to favour development in height and clean stems.

V. Hoeing and weeding.

VI. Pruning for the proper formation of the crown and when the tree is 16 to 20 ft. high.

VII. Protecting the plants from excessive shading, which hinders their normal development.

VIII. In game preserves, protection against damage caused by animals.

IX. Thinning out in due time to favour a normal formation of the crown, the increment of wood and the independence of the trees.

4 and 5 — From the two English experiments quoted the following considerations are drawn:

I. The greater productivity of *J. nigra* in comparison with oak (14 walnuts have the same volume as 20 oak trees in the same stand 80 years old).

II. It appears that the American seed of *J. nigra* is much superior to the English seed, both for its power of germination and for the vigour of the seedlings.

272 – Twenty-five Years of Reafforestation in the Karst in Carniola.

RUBBIA, K. Fünfundzwanzig Jahre Karstaufforstung in Krain. — *Bericht der Aufforstungs-Kommission für das Karstgebiet des Herzogtums Krain über die Tätigkeit vom Jahre* 1886 *bis Ende* 1911, pp. 97 + figs 2. Lubiana, 1912.

In Carniola the reafforestation of the Karst (1) was undertaken in virtue of a special law and through the agency of a commission appointed on October 11, 1886.

The agricultural and forestry conditions of the two Karst districts were according to the general land registry of 1870 as follows :

		Adelsberg acres	Loitsch acres
High forest		39 375	149 723
Coppice	calcareous	5 053	6 491
Common pastures and alps	Karst soil	67 006	57 395
Unproductive land		4 566	5 864
Agricultural land		83 911	79 458
Common pastures.	sandy Karst soil	21 704	

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(1) The South European Karst region extends, for the major part in Austrian territory from the Alps to the borders of Greece and covers about 193 000 square miles. The Karst proper forms a limestone plateau on the Austrian and Carniola coast. The reafforestation of the Karst originated in a resolution passed by the " Oesterreichischen Reichsforstvereins " at Triest in 1865. After several attempts, this resolution was adopted in the laws for the reafforestation of the Karst, for the territory of the city of Triest on September 27, 1881, for the princely county of Görz and Gradiska on December 9, 1883, for the Duchy of Carniola on March 9, 1885, and for the March of Istria on May 7, 1886. The characteristic of these laws consisted in the constitution of a Commission for the reafforestation of the Karst, with powers to form a reafforestation registry, comprising all those lands which, in the interest of the country, it was deemed necessary to reafforest within a given time. The State was also given powers to expropriate such lands. In 1906 the reafforestation land registry bore the following :

	Karst Lands — sq. miles	Lands entered in the reafforestation registry — sq. miles
Triest	23.13	4.51
Görtz and Gradiska	748.26	31.98
Istria	1 411.32	53.10
Carniola (Adelsberg) . . .	2 878.14	14.27
Total . . .	5 060.85	

(Cf. RUBBIA, K. Oedlandaufforstungen : Mittel zu ihrer Förderung (Die Aufforstung des Karstes in Oesterreich). — *VIII Internationaler Landwirtschaftlicher Kongress*, Sektion VIII, Referat 3, Bd. II, pp. 22. Wien 1907 ; LOREY'S *Handbuch der Forstwissenschaft*, Zw. Aufl., I. Bd., pp. 67-68. Tübingen, 1903 ; FERNOW, B. E. *A Brief History of Forestry, in Europe, the United States and other Countries*, Austria Hungary, pp. 158-159. Toronto, Ont.).
(*Ed.*).

Taking into account the unproductive lands and the pastures, 156 534 acres are to be considered as Karst lands.

According to the reafforestation register there were at the end of 1911:

	acres
Areas to be reafforested, Adelsberg	9 369.5
" " Loitsch	239.0
Total . . .	9 608.5
Of these, reafforestation has been carried out on	7 191
There remain to be reafforested	2 417.5

The 9608.5 acres entered in the reafforestation registry are divided as follows:

	acres
Collective property	6 862.0
Communal "	21.5
Private "	2 716.5
Expropriated "	8.5
	9 608.5

The data concerning the cost of reafforesting and of interculture are of practical interest:

Cost	Planting per 1000 plants		Planting per acre	
	Extremes	Average	Extremes	Average
Labour only	4s 9d to 8s 7½d	6s 6d	17s 3d to £1 15s 3d	£1 5s 9½d
Total cost	6s 0d to 9s 11d	7s 10⅓d	£1 1s 11d to £2 0s 11d	1 11s 2½d

	Filling up gaps per 1000 plants		Filling up gaps per acre	
Labour only. .	4s 4½d to 9s 0½d	6s 1½d	—	—
Total cost . .	5s 8¾d to 10s 3¾d	7s 8½d	—	11s 7½d

The above data refer to 6566 acres replanted with 26 043 270 nursery plants; and which required 18 491 440 plants (71 per cent) for gapping up, and with intercalary plantations and under covert, 1176 017 plants and 7116 lbs. of fine forest seeds on 1184 acres.

According to article 5 of the Law on reafforestation, the plants to the number of 44 180 577 (96.6 per cent.) were taken from the State nurseries at the nominal price of 10 *d* per 1000 plants, besides some free of charge; 545 050 were supplied by the Commission's nurseries and 984 700 from private nurseries; altogether 45 710 727 at an average cost of 11 ½ *d* per thousand.

As for protection, it is to be noted that of the 238 acres which were destroyed by fire, 144 acres were burned through imprudence, 41 by sparks from locomotives, 53 by unknown agencies. 19 612 feet of new firelines were made and 168 811 were re-established; 122 360 ft. of new protection walls were built and 19 453 ft. were repaired, and 6 819 feet of wire netting were put up.

Out of a total of £ 27 101 set apart for all these works from 1887 to 1911, 75 per cent. is contributed by the State, 13.2 per cent. by the Province, 4.2 by other parties concerned and 7.2 from various sources. The expenses during the same period amounted to £27 005 8s, and of this sum 68 per cent. was spent in reafforestation proper, or 72.8 if the cost of nurseries and of protection is included; 0.4 per cent. was devoted to the purchase of land, 14.8 to surveillance, 0.4 to the reafforesting registry, 3.4 to the Commission, 2.2 to the secretary's office, 2.4 to rewards, and 3.6 to sundries.

From the sylvicultural point of view, experience has confirmed the excellence of Austrian pine for the Karst lands, planted on 91.6 per cent. of the area, in dense stands of 4 050 plants per acre, that is 3ft 3 in. by 3ft. 3 in. apart. For the higher and more exposed situations Corsican pine is especially useful. Above 2 000 ft., and in sheltered positions on good soils, Norway spruce thrives; it has been used on 4.4. per cent. Notwithstanding the preference shown by the inhabitants for larch, because it does not prevent the growth of grasses, the plantations of this tree (0.32 per cent.) did not give good results, nor did the few specimens of Japanese larch grown do any better. Scotch pine (planted on 0.73 per cent.) does well in localities that do not get much snow and under covert of spruce, oak or ash. The results obtained with Banks' pine were negative. White pine is particularly useful for gapping up and for planting among other trees. White spruce, indigenous to the Karst, will play an important part in the work of reafforesting Karst lands, especially under covert of Austrian pine and Scotch pine, and in this way about 1 190 acres have already been planted.

Broad-leaved trees, which are now being planted experimentally, will also be an important factor in the Karst forest economy when the preliminary plantations of conifers have created suitable conditions. At present nothing can be stated about oak, but it appears that ash, sycamore, lime, common alder and, for the improvement of the soil, white alder, have given good results.

In conclusion, considering the success which has attended the work of reafforestation, it is to be regretted that provisions for the consolidation and economic utilization of the accomplished work should be wanting. The Ministry of Agriculture has, however, taken into consideration the proposals of the Commission as to the reform and necessity of bringing up to date the law on the reafforestation of the Karst, and has recognized that they are justified and opportune.

LIVE STOCK AND BREEDING.

HYGIENE

273 - Experiments on the Efficiency of Antirinderpest Serum.

WARD, ARDISPALD and WOOD, FREDERICK WILLIAM. — *Department of Public Instruction of the Philippine Islands, Bureau of Agriculture, Bulletin* No. 19. Manila, 1912.

The writers have made experiments with antirinderpest serum on cattle and buffaloes. Some of the serum used for inoculation was made by the experimenters themselves, while some was procured from the Pasteur Institute at Nha-Trang (Indo-China) and from the Experiment Station for Animal Diseases at Tokio. 175 animals were experimented upon in 11 separate experiments, 26 serving as a control and not being inoculated. All the animals were exposed to the infection of rinderpest. The experiments seem to show that antirinderpest serum does not prevent infection with rinderpest. On the contrary, animals injected with serum and exposed to rinderpest soon contract the disease and pass through a more or less modified attack It has been shown that the blood of animals is infective during this attack. If by passive immunity is meant an artificial condition by means of which the severity of the attack is lessened, the writers grant that such exists, but deny that there is a passive immunity of a kind that prevents invasion by the virus of rinderpest.

274 - Fracture of the Thoracic (Dorsal) and Lumbar Vertebrae in the Horse.

RUDAU, Georg. Zur Kenntnis der Brust- (Rücken-) und Lendenwirbelbrüche des Pferdes. — *Monatshefte für praktische Tierheilkunde*, Part 5-6, pp. 193-255. Hamburg, January 11, 1913.

Fractures of the vertebra in the dorsal and lumbar regions are not so frequent as those in the neck ; nevertheless they form about 4 to 5 per cent. of all the fractures of bones in horses. Among them the first lumbar vertebra and the sixteenth to the eighteenth dorsal vertebrae are the most frequently broken. The writer distinguishes between outer (direct) and inner (predisposing) causes. Among the first he includes : leaping, falling, colliding, getting up under the travis beam, creeping through a fence, casting for an operation, etc. The effects are all the more dangerous as the inner causes (conformation of bones and muscles) predispose the animals to fracture. The bones are often the seat of the predisposing causes. Osteological investigations have proved that the vertebrae of the back and loins are not all equally developed. The strongest are those at the extremities of the column and the weakest those in the middle. In this part also the intervertebral disks, which by means of their elasticity deaden sudden shocks, are less developed. Consequently fractures happen more frequently here. The processes of the vertebrae are more strongly built than the body and the arch ; in these the spongy mass predominates over the stronger compact substance ; consequently fractures in the body and in the arch are more frequent than in the processes. Pathological alterations in the dorsal and lumbar vertebrae (exostoses), ossification of the intervertebral disks and of the articulations, rachitis, osteoporosis, etc., favour the action of direct agents. As further inner causes (seated in the muscles) the writer mentions the contractions of the long muscle of the back (*Musculus longissimus dorsi*). When horses kick violently or are cast down the spinal column is strongly curved, and if at the same time a contraction of the muscles takes place, the excessive strain upon the vertebrae causes them to fissure or to fracture.

The symptoms are different according to whether the body or the processes of the vertebrae are injured. In the latter case the spinal chord rarely suffers, whereas in the former it does so frequently and presents the following symptoms :

1) Paralysis of the hind quarters (sitting position of the animals).
2) Dropping or retention of urine.
3) Perspiration.
4) Dyspnoea, frequency of pulse.

Symptoms accompanying fissure are :

1) Unsteady hind quarters.
2) Curved back.
3) Stilted gait.
4) The animals are capable of working (even for several weeks) until the fissure turns into a fracture.

The diagnosis of fractures of the vertebral processes are easier (sensations of pain, resting position of the animal); their prognosis is also more favourable (cure is possible).

The author recommends for fissures of the vertebrae (eventually curable), rest, tying the animals so as to prevent them lying down, and administration of phosphate of lime. Fractures of the vertebral processes are curable ; rest is necessary, as well as removal of the splinters of bone. Fractures of the body of the vertebra are incurable.

275 - Pigments carried by Cattle.

BREEDING

DAVIES, C. J. in *Live Stock Journal*, Nos. 2024 and 2025, pp. 62 and 85-86. London, January 17 and 24, 1913.

Although a good deal of work has been done of late in investigating the pigments carried by the smaller mammalians, no similar investigation seems to have been carried out on cattle. The writer has endeavoured to supply this deficiency.

The method he adopted was to place a small tuft of hair in a watch-glass and a few of the same hairs in the well of a microscope slide, covering each with a 40 per cent. solution of caustic potash. On the slide the progressive dissolving out of the pigment could be watched from day to day without disturbing the hair ; in the watch-glass the hair was microscopically examined, washed and transferred to a fresh potash solution when one pigment had dissolved out. The operation was repeated.

Three pigments were found by the above method : yellow, brown and black.

The yellow pigment commences to dissolve out almost immediately. The pigment takes more than four and less than nineteen hours to completely dissolve out. The solution is bricky red. The pigment granules appear under a high magnification to be circular nucleated cells.

The brown pigment is found dissolving out from hair washed free of yellow granules, but not before 29 hours after setting in potash solution; after 68 hours in all, the hair is, as a rule, free of this pigment, which gives the liquid containing it a pale yellowish colour. The granules of this pigment, besides being smaller, are irregularly shaped and invariably cluster together.

Black. This pigment dissolves exceedingly slowly and is difficult to isolate. Hairs with black pigment at the end of a fortnight's immersion in caustic potash appear bright brown under the microscope. The black pigment granules are exceedingly small, circular in shape and do not as a rule cluster together.

The investigations bore on the hair pigments of several English breeds of cattle, and their results seem to point to the universality of considerable quantities of yellow and brown pigments in every breed; traces of black are found in all the animals examined, though not invariably in every hair.

It appears thus that as cattle all carry the same three pigments, their varying colours are obviously due to the respective quantities and arrangements of these pigments. It seems that yellow and black overlying brown gives dun; yellow only overlying brown gives yellow or red, according to the quantity of yellow present; thickly packed black and brown, even when covered by a thin layer of yellow, gives black. Yellow in any quantity in the tip makes the hair "rusty".

The writer treats further of the inheritance of colour, which he believes occurs on Mendelian lines, and that in general, in a cross, the darkest type of pigmentation dominates over the lighter one, or rather covers it.

WORK OF
LIVE-STOCK
ASSOCIATIONS
AND OTHERS
FOR THE
ENCOURAGEMENT OF
BREEDING

276 - Stock Breeding in the Kivu (Belgian Congo).

CARLIER. L'Elevage au Kivu. — *Bulletin agricole du Congo belge*, No. 3, pp. 741-755; No. 4, pp. 775-798. Brussels, September and December 1912.

The geological, topographical and climatic conditions of the Belgian Congo are by no means uniform, and for this reason the fauna and flora vary in the different part. While the southern tribes (Babuye and Wabembe) chiefly keep goats, sheep and fowls, the neighbouring Wawira have already domesticated the cow; among the Warundi, Watembo and Wanyabongo, the latter animal is generally kept, some of the natives possessing herds of 1 000 head.

I. *Fowls.* — These are very widely kept and are especial favourites with the Wanyabongo tribe; they are the property of the women. The fowl of the country is small, active and pugnacious; the hens lay about 10 eggs before sitting. Less common is the Arab fowl, a product of a cross with Orpingtons, or other English breeds.

II. *Goats.* — Here too, this is the "poor man's cow". The writer distinguishes two breeds: the one long-haired, which yield little milk, and the other short-haired and with good milking properties. The latter are said also to fatten well.

III. *Sheep*. — The management is the same as for goats. The breed is small and has a fat tail; it gives no wool. Sheep are chiefly used for barter in the native markets.

IV. *Cattle*. — Some of these are indigenous and others have been imported from German East Africa. Three types are to be distinguished; they are chiefly characterised by late maturity and a prominent hump like a zebu's, they are red or black. The writer distinguishes three types:

1. Hornless cattle ("Sungu"). Height at withers nearly 4 ft.; back straight; ears long (about 7 ½ in.; rump and thigh well developed. Milk breed.

2. Cattle with short horns. Found where the climate is less extreme (Wanyabongo). They are larger than the cattle first mentioned. The muzzle is broad and short, the horns are directed upwards and bent forwards; face slightly dished. The back is somewhat hollow, while the large belly betokens a plentiful food supply. The chest and limbs are powerful and well-developed as is also the udder.

3. Cattle with long horns. Head light; horns strong, 28 to 40 inches long. Muscular system and bones poorly developed. This is the least valuable breed.

Although no systematic breeding is practised, yet the natives are guided by certain general rules in breeding. As the grass in the meadows is scanty in the dry season, the herds are then driven to the often distant river valleys and swampy land. They are always under the supervision of a herdsman, who has a personal interest in the number of calves produced.

The inhabitants hardly take milk except as cheese. The Wanyabongo obtain the curd spontaneously by letting the milk stand a long time, while the Nya Ruanda mix a little urine with it and the Warundi use slices of the fruit of a citrus tree called "Nongo." Butter-milk is used chiefly as an article of food for women and children while the former use butter as a toilet preparation.

The flesh of the fowls, goats and cows is eaten by the natives, while the skins of the two latter are turned to account by them. The manure is collected from around the huts and used for fuel or for the banana or tobacco crops.

Markets ("Sokos") are held regularly at fixed places and afford an opportunity for the exchange of cattle, sheep and meat.

In the last chapter, the writer mentions the most serious cattle diseases.

277 - Horses and Horse-Breeding.

HORSES,
ASSES AND
MULES

Bush-Brown, H. K. in *The American Breeder's Magazine*, Vol. 3, No. 4, pp. 282-289. Washington, October-December 1912.

In a former article the writer suggested that the structure of the best race horses, both trotters and runners, should be studied in their living active form and from the skeleton after death as a means of establishing a method of defining types and of ascertaining which structural forms are the most favourable to speed and endurance. The greatest differences between breeds are largely due to the structure of the skeleton. And this suggests the need of an accurate method of measurement based upon a unit common to all individuals. The writer recommends as a base the height of the horse at the withers (1), which is divided into three equal parts denominated "heads". Each head is further divided into four parts, called "quarters," and each quarter into six parts called "minims".

These denominations are abbreviated to H for heads, N for quarters and M for minims. All the measurements of the body of a horse are to be given in these measures, and as the basis of all of them is the height at the withers an exact representation of the proportions of the body of every horse measured with this system can be made.

The writer gives several figures further illustrating his system, which he recommends also for the measurement of cattle; but instead of taking the height of the cow at the withers it is necessary to take the length from the front of the shoulder to the end rump bone or ilium.

278 - Forage Rations for Growing Horses.

SNYDER, W. P. in *Bulletin of the Agricultural Experiment Station of Nebraska*, Vol. XXIV, Art. VIII, *Bulletin* No. 130. Lincoln, Neb., 1912.

At the agricultural experiment station of the Nebraska University, foals were kept from October 1907 to January 1911 on various pastures and with various winter rations. The experiment was commenced with 32 colts, of which 16 were males, 9 mares and 7 mules; the mules, with one exception, were sired by the same jack. The colts, also with one exception, were sired by a pure-bred Percheron stallion. The dams were chiefly Montana mares.

The colts were allowed to run together in an alfalfa field from October 1907 until January 1, 1908, when they were divided into separate lots, and fed as follows:

Lot 1, Alfalfa hay in winter, and alfalfa pasture in summer.

Lot 2, Alfalfa hay in winter, and prairie pasture in summer.

Lot 3, Prairie hay and cane hay in winter and prairie pasture in summer.

The grain for all lots during the first winter was 4 lbs. per head daily, consisting of two-thirds corn and one-third oats. Later they were given a more abundant grain ration when they worked (when three years old).

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(1) The height at the withers has been used by S. v. Nathusius of Halle for years as the basis in the measurement of horses; the other measures being expressed by him in percentages of this basis according to the method adopted by A. Kraemer and H. Lydtin for cattle measurements.

H. Krämer of Hohenheim is opposed to the use of the height at the withers as a basis for the measurement of horses.

See: S. v. Nathusius, Pferdemessungen in *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Parts 43, 112 and 205. Berlin.

H. Krämer, *Aus Biologie, Tierzucht und Rassengeschichte*, p. 260 *et seq.* Stuttgart, 1912. *Id.*, *Das schönste Rind*, III Edit., p. 31 *et seq.* Stuttgart, 1912. (*Ed.*).

TABLE I.

Lot	First winter Jan. 1, 1908, to June 15, 1908	First summer June 15, 1908, to Oct. 31, 1908	Second winter Oct. 31, 1908, to April 21, 1909	Second summer April 21, 1909, to Nov. 2, 1909	Third winter Nov. 2, 1909, to March 18, 1910	Third summer March 10, 1910, to Dec. 1, 1910	Fourth winter Dec. 1, 1910, to Jan. 14, 1911
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	152.5	244.5	5.5	181.5	— 20.6	39.7	77.3
2	142.2	93.8	95.0	107.7	22.6	120.7	41.6
3	99.5	113.5	4.5	191.0	— 64.8	133.3	63.0

Lots 1 and 3 lost weight during the third winter.

TABLE II.

		Lot 1	Lot 2	Lot 3
Number of colts		10	9	10
Average first weight, January 1, 1908		588.5 lbs.	617.7 lbs.	617.7 lbs.
Average last weight, January 14, 1911		1268.4 »	1228.3 »	1157.5 »
Average gain		677.9 »	610.6 »	540.0 »
Cost of feed .	Grain	$ 8.41	$ 8.41	$ 12.28
	forage	» 31.80	» 31.80	» 20.93
	pasture	» 25.09	» 12.27	» 12.27
Total cost of feed per colt . . .		» 65.30	» 52.48	» 45.48
Av. purchase price		» 57.00	» 53.70	» 52.00
Interest at 6 per cent. on purchase price		» 10.38	» 9.78	» 9.47
Total cost per colt, January 14, 1911		» 132.68	» 115.96	» 106.95

Lot 3 was fed grain during the second winter also.

Two lots were composed of 11 colts and one of 10. In two of the lots there were two mule colts each and in one three.

In March 1908, when the colts were not yet one year old, distemper attacked those in Lots 1 and 2. Three of them died. The colts in Lot 3 were at a certain distance from the others; they fell sick later and not severely. The male colts were castrated in June 1908; when they were three years old all of them were broken and worked.

The average gains per head are shown by Table I. Table II gives the average weights, costs of food, etc.

The results of the experiments may be summarized as follows :

It appears that it is profitable to pasture alfalfa when the colts are sold as yearlings or two-year-olds, or when there is some special incentive for getting rapid gains, or when the cost of alfalfa pasture and of native grass pasture are about equal.

Alfalfa pasture put the colts in excellent condition and produced no injurious effects.

Feeding alfalfa hay in winter was profitable ; it produces more increase in weight on colts than prairie hay and cane hay. In spring colts put on pasture when thin in flesh make better gains than similar colts put on pasture when in good flesh.

The gains in weight were greater in the first year than in the second, and greater in the second than in the third year.

279 - Jersey-Angus Cattle.

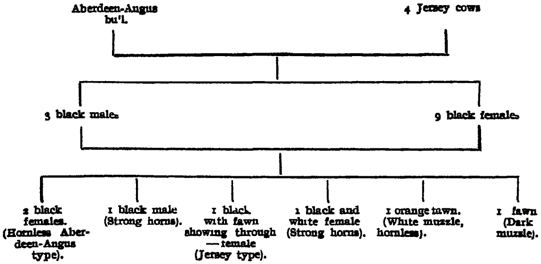
PARLOUR, WILLIAM in *Live Stock Journal*, Vol. LXXVII, No. 2025, p. 85. London, January 24, 1913.

The writer gives an account of the results of Jersey-Angus crosses, which were made in the north of England by an owner, who, finding that Jerseys could not stand the severe climate of that part of the country, wished to try to combine the milkfat-producing properties of the Jersey with the flesh-producing properties of the Aberdeen-Angus breed.

The first cross, that of an Aberdeen-Angus bull with a Jersey cow, was eminently successful. The calves from such crosses were all black, one female only showing a patch of white near the udder. There are traces of the Jersey in the udder (which is yellow, well shaped and silky), and the inside of the thighs and the ears are also covered with hairs, as is the case with the latter breed. The females were all polled, but the males, with age, usually developed embryo horns, or scurs.

A number of the cows have produced calves and all but one have been as good milkers as their dams. The steers, which were only slightly larger than the Jerseys, have fattened readily and fetched good prices.

The first cross females have been crossed with sires of precisely the same breeding as themselves, but the offspring are of varied colours and characteristics. The following table shows how the herd is progressing:


Aberdeen-Angus bull
4 Jersey cows
3 black males
9 black females
2 black females. (Hornless Aberdeen-Angus type).
1 black male (Strong horns).
1 black with fawn showing through — female (Jersey type).
1 black and white female (Strong horns).
1 orange fawn. (White muzzle, hornless).
1 fawn (Dark muzzle).

The sex of the last two animals in the third generation is not given. (*Ed.*).

280 - Crosses between Algau and African Cattle.

SPANN. Kreuzungen zwischen Algauer und Afrikaner Rindern — *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No 2, pp 18-19 Hannover, January 10, 1913.

After the rinderpest had destroyed the greater number of the cattle in German South-West Africa, about 10 years ago, the Government, amongst other measures for the encouragement of cattle-breeding, tried importing Algau bulls.

Encouraged by the success of this attempt, Hr. Hüttenhain, a farmer, made crosses between Algau bulls and the native Bechuana and Griqualand cows. The Bechuana cattle, bred in Bechuanaland, are usually whole-coloured, reddish black, red, or light with dark pigment. The height at the withers is 55 to 60 inches; the long narrow head bears well-developed horns, which curve upwards like those of the Hungarian Steppe cattle. The ribs are slightly curved and the back is rather hollow. The animals narrow behind the shoulders; the rump is very sloping. They are nearly always knock-kneed and have long legs.

The Griqualand West cattle, from the Cape Province, are usually all red; they also have sloping rumps, but their horns are much smaller than those of the Bechuana breed.

Both breeds are reared only for working purposes. During their first lactation period, the cows give one to two quarts of milk daily; this later increases to two to three quarts. It contains 7 to 8 per cent. of fat.

For crossing with Algau bulls, whole-coloured red cows were selected. The resulting offspring had relatively well-formed backs. The head of the Algau bull was inherited unchanged. The rump was broad and the tail was set on higher. The horns had only a third of the spread of those of the dam's and were weaker. The colour of the heifer calves is mouse-grey, like that of the Montavon breed, but with a little dark red showing through and a pale stripe down the back, as well as light belly. The bull-calves are light in colour when young, but become dark in a few months; the stripe down the back persists. All the cross-breds had slate-grey muzzles, white horns with black tips and black hoofs. Without forfeiting much of their capacity for work, the animals increased in weight, while the cows yielded more milk, giving over five quarts after the first calf, and seven quarts after the second.

The above-mentioned bull was 1 3/4 year old in 1906, when brought from Algau. At the present time, its descendants on Hr. Huttenhain's farm number 150. Although seven years old, the bull is still used for service. Like all the other Algau animals, it is well acclimatised.

With regard to the fodder supply, Algau cattle are very suitable to German South-West Africa. The best age for exporting them to Africa seems to be two years ; if sent out younger, their growth is checked.

SHEEP

281 - Breeding Experiments with Welsh Mountain Breeding Ewes.

University College of North Wales. Bulletin VII. Bangor, 1912.

The experiments on the use of rams of various breeds with Welsh mountain ewes, which were undertaken at the Aber Experimental Farm of the University College of North Wales for the production of fat lambs, were commenced again in the autumn of 1911, after a break of two years. It was found that the best butcher's lambs were undoubtedly the Southdown-Welsh cross ; next to these came the Wiltshire cross.

For the season 1911-12, it was determined to test these two well-proven crosses against others that had not previously been tried For this purpose, five lots of ewes were selected, 25 in each lot ; these were mated with Southdown, Wiltshire, Hampshire, Romney Marsh and Wensleydale rams. The lambs were dropped between March 4 and April 6. Particulars of the lambs are given in the following table. The lambs were, as usual, sold to the butcher as soon as they became fat.

Lot	Description of ram	Ewe	Number of lambs dropped	Percentage of lambs sold			Average live weight of lambs when sold		
				On or before July 11	On or before Aug. 12	On or before Oct. 31	On or before July 11 lb.	On or before Aug. 12 lb	On or before Oct. 31 lb.
I	Southdown . .	Welsh Mountain	27	81	19	—	66	64	—
II	Wiltshire. . . .		11	60	40	—	70	74	—
III	Hampshire . . .		29	67	26	7	70	67	75
IV	Romney Marsh .		26	64	36	—	73	73	—
V	Wensleydale. . .		26	54	33	13	70	74	74

It will be seen that the Southdown-Welsh Mountain cross gave the highest percentage of lambs fit for the butcher at the earliest date ; but they were not the heaviest in weight.

282 - Introduction of Karakul Sheep into Argentina.

GARCIA, TOMAS R. Los ovinos Karakul. Generalidades sobre el origen y la importación al Pais. — *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 10, pp. 1145-1178. Buenos Aires, 1912.

The Karakul breed of sheep, which has been introduced into Russia, Bosnia-Herzegovina, Austria, Germany and the United States, was introduced into Argentina in 1911 by means of a small flock (16 ewes and 4 rams) presented by the Emperor of Austria to the President of the Argentine Republic. The small flock is now tended with care in the " San Nicanor " establishment, Sierras del Azul, near Vela. It is intended to form there a centre for raising the pure breed and at the same time to study the advantages of crossing it with the sheep of the various regions of Argentina. The writer believes that for crossing purposes the hardy native breed or " criolla " will prove the best. Should the Karakul breed become so numerous in Argentina as to become of practical importance, the writer believes that the region that will suit it best, both for the conditions of life of the inhabitants as well as for the physical nature of the country, will be especially the north-west of the Republic. The breeding of Karakul sheep can be carried on in the Calchaquies valleys; in the del Toro valley in the north of El Candado; in the Pampa grande, La Alemania, Inca Huasi; in a great part of the plateaus and mountains of the province of Salta, in the Humahuaca valley; in almost all the mountainous region in the west of the province of Jiujuy; in the Andine provinces; the pre-Cordillera valleys and lastly in many of the southern territories, especially in their western part bordering on the Cordilleras.

As is well known, the most valuable product of Karakul sheep is the skin of the recently born or unborn lambs. These skins during recent years have attained the average price of 15*s* 10*d* and a maximum of 63*s* 3*d*, untanned. The tanned skins fetch in Buenos Aires from 34*s* 11*d* to 69*s* 10*d* each.

283 - Pig Feeding by means of Automatic Troughs.

PIGS

LEPEL-FREISTATT. Schweinefütterung an automatischen Futterkästen, und deren Bedeutung für Mast, sowie Zucht und natürliche Schweinehaltung. — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 7, pp. 74-75. Berlin, January 22, 1913.

Frequently the advantage of early fattening is rendered questionable when it is attained by costly pig-sties and want of exercise. Should illness break out, or great variations arise in the cost of barley or the price of pigs, the sties, being useless for other purposes, are often empty for months.

The writer therefore recommends the automatic dry-feeding of pigs (1); this process offers the following advantages in fattening:

1. Special fattening sties with fixed troughs are no longer necessary; any space (shed, empty cow-house, barn) which has a good floor can be turned to account, provided there is ample drainage.

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(1) See No. 1660, *B*. Dec. 1912. (*Ed.*).

2. Runs are easily attached to these sties.

3. A large number of animals, 20 to 100, of different ages and size can be kept in such a place.

4. The pigs can eat as much as they want without wasting the food.

The writer considers automatic dry feeding equally suitable for breeding pigs ; but sows with young pigs should be given a lighter and larger sty; also the young pigs must be marked and accustomed to running about and movement before they are placed with the others (at the age of 3 to 4 weeks). It is well to divide off a small run from the sow's pen, which should have apertures allowing the young pigs access to the dry food in order that they may become accustomed to it. For about a fortnight before and after weaning the young animals must be given liquid food (skimmed milk, whey) in addition to the dry food.

POULTRY

284 – The Influence of Selection on the Size of Fowls' Eggs.

Einfluss der Zuchtwahl auf die Grosse der Hühnereier. — *Landwirtschaftliche Zeitschrift für Oberösterreich*, Year 57, No. 2, pp. 9-10. Linz, January 15, 1913

The Cooperative Egg-Societies of Upper Austria, which since 1905 have bought eggs by weight, have announced that their members have during 7 years increased the average weight of fowls' eggs from 1.91 oz. to 2.01 oz. by means of careful selection, good food and proper management.

The Otterbach Poultry Breeding Institution gives the following figures.

Average weight of eggs (in ounces)

Year	[illegible]				[illegible]			
	1-year	2-year	3-year	all ages	1-year	2-year	3-year	all ages
1905	1.86	2.04	1.95	1.92	1.83	—	—	1.83
1907	2.07	2.12	2.04	2.09	2.05	2.11	1.99	2.06
1909	2.14	2.18	2.12	2.13	2.06	2.07	2.10	2.08
1911	2.04	2.07	2.18	2.07	1.99	2.06	2.07	2.02
Average (1)	2.04	2.11	2.08	2.06	2.00	2.07	2.07	2.02

(1) In reckoning the averages, the weights of the eggs of 1906, 1908 and 1910 were included.

Proportions of the Weight of the Eggs.

Year	Partridge Italians				Golden Wyandottes			
	Eggs of 1 76 to 1 94 oz	Eggs of 1.94 to 2 12 oz	Eggs of 2 12 to 2.29 oz.	Eggs over 2 29 oz	Eggs of 1 76 to 1.94 oz	Eggs of 1 94 to 2 12 oz	Eggs of 2.12 to 2.29 oz.	Eggs over 2.29 oz.
	%	%	%	%	%	%	%	%
1905	50	50	—	—	100	—	—	—
1907	11 2	55 5	25 9	7 4	20 0	46 7	33 3	—
1909	3 3	30 0	60 0	6 7	7 1	04 3	28 6	—
1911	7 4	66 7	25 9	—	18 2	77 3	4 5	—
Average	17 2	49 5	29 8	3 5	27 9	49 3	22 8	—

285 – Farm Flock Poultry Competition.

TOOLE, A. A. *in The Farmer's Advocate*, Vol. XLVII, No 1054, pp. 1634-1635 and 1708. Winnipeg, Canada, December 4, 1912.

The Norfolk Poultry Association organised in the winter 1910-1911 in Norfolk County, Ontario, a competition among the poultry flocks of the farms of the district. The following were the rules of the competition.

1. No entry fee will be charged and all farmers in the County of Norfolk complying with the rules hereinafter stated are eligible for entry.

2. That only those farmers having flocks of 35 or more birds will be eligible for entry.

3. That each farmer entering the competition will keep a daily record of the egg yield of his flock on blanks furnished him by the Association for that purpose, from the first day of December 1910, till the 31st day of May 1911 inclusive

4. That each farmer entering the competition will keep a financial statement, showing the kinds, amount and cost of food fed to his flock, and the total receipts from the same during the six months between the 1st day of December 1910, and the 31st day of May 1911.

5. That each farmer entering the competition will sign a written declaration or affidavit, affirming that the record of the egg yield and the financial statement of his flock, referred to in Rules 3 and 4 and made by him, are correct statements of the truth, and that he will forward the same to the Secretary of the Association, not later than the third day of June 1911

6. Any competitor who discontinues keeping the records referred to in Rules 3 and 4, at any time during the competition, will be disqualified.

7. All entries must be made on or before November 25, 1910.

8. The judges appointed by the Association will visit the farm of each competitor at least once, and oftener if deemed necessary, some time during the competition in order to see the flock and the management by the owner.

The competition was advertised through the medium of local newspapers and special printed matter. Twenty-two entries in all were received.

Professor W. R. Graham, of the Ontario Agricultural College, undertook the task of judging the flocks at the different farms, using the score card which was set by the Norfolk Poultry Association, in which 250 points were the maximum given for the condition of the flock, 150 points for the cleanliness, etc., of the fowl-house, and 450 for the management of the flock (method of feeding, care and sale of eggs, marketing of table fowls, number of cocks, cocks removed from flock after breeding season, financial statement, including profit, egg-yield).

Some houses were found on inspection to be in a somewhat dirty condition, others were remarkably clean. Ventilation by means of cotton in the windows instead of glass was in evidence in the majority of the houses.

Only three flocks of the 22 were mongrels and the breeds were of many kinds, including Plymouth Rocks, Wyandottes, Rhode Island Reds, Orpingtons, Leghorns and Minorcas.

At the conclusion of the contest, the competitors sent up their information to headquarters and a meeting for the purpose of encouraging improved measures of poultry keeping was held at the county town.

Table I gives a summary of the costs and profits of the individual flocks :

TABLE I.

Number	Breed	Number of hens	Grain per hen per month lbs.	Cost per hen per month cents	Eggs per hen per month	Profit per hen per six months cents
1	Plymouth Rock	50	7.5	9.0	11.7	67.74
2	»	39	6.3	7.5	13.2	93.3
3	»	52	6.3	7.7	8.0	32.6
4	»	49	5.4	8.0	10.5	59.0
5	»	70	5.9	5.4	4.1	4.54
6	Leghorn	95	4.9	8.2	16.6	135.1
7	»	85	5.3	7.1	12.9	87.9
8	»	58	5.1	6.0	10.0	57.8
9	»	126	4.2	7.5	10.9	66.0
10	»	90	5.7	5.5	7.2	33.1
11	»	87	5 0	5.1	8.3	46.6
12	»	85	5.6	5.7	10.1	64.1
13	Wyandotte	35	8	10.7	16.05	73.9
14	»	140	7.6	8.4	7.4	20.5
15	»	69	7.2	9.8	8.4	24.4
16	Cross bred	70	5.6	6.06	8.9	48.4
17	»	51	9	9.3	11.3	53.7
18	»	48	5.4	6.6	10.7	63.9
19	Orpington	114	5	7 4	8.3	47.5
20	Rhode Island Red	45	5.2	5.5	11.9	89.6
21	Minorca	70	7.8	9.0	10.0	41.4

The profit, *i. e.* the amount received for eggs above the cost of feed, for the six months from December 1 1910 to May 31 1911, averaged for all the 21 flocks 57.67 cents per hen, or 57.67 dollars per 100 hens. The best results ($1.97) were obtained by No. 6, the flock which won the competition.

Five of the competitors continued their records till December 1, 1911; the results are given in Table II.

TABLE II.

Number	Breed	Number of hens	Grain per hen per year lbs	Cost per hen per year cents	Eggs per hen per year	Profit per hen per year cents
1	Plymouth Rock	50	03 4	78.0	128.2	104
6	Leghorn	95	50.4	77.5	157.4	197
8	»	58	50.4	60.0	123.2	119
19	Orpington	114	49.5	70.0	85.5	85
20	Rhode Island Red	45	53.	58.8	124.8	115

The writer further sought to discover the cause which determined the profitableness of the different flocks, and came to the conclusion that this is not to be found so much in the breed, as in the feeding and management of the fowls. The best results were obtained where the flocks were given buttermilk and green food, and where the fowl-house was well ventilated. Further figures are given in support of this view.

286 - Methods of Protecting Fish Ponds from Frost.

FISH

HEYKING, H. Vorbeuge vor Frostschäden in der Fischerei. — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 3, p. 27. Berlin, January 8, 1912.

The layer of mud which covers the bottom of lakes and ponds is in a continual state of decomposition, thereby giving rise to marsh gas, sulphuretted hydrogen and ammonia. When the pond is frozen, these more or less poisonous gases pervade all the water and adhere in the form of bubbles to the lower surface of the ice. If the ice is covered with snow, so that the light cannot reach the water, the microspic water plants are unable to absorb ammoniacal nutritive substances and to give off oxygen. As soon as the supply of oxygen in the water is exhausted the fish thus perish from suffocation.

In order to prevent, or remedy, this want of oxygen, the writer suggests the following methods.

The pond in which the fish pass the winter should under no circumstances be overcrowded. Fish should not be kept through the winter in ponds where the mud stratum is more than from 8 to 12 in. thick; but if circumstances necessitate the use of such a pond, it must be left dry from the month of August, at latest, until the time for stocking it. This allows the mud to settle and the acids to escape from the surface. The application of phosphate of lime to the soil is much to be recommended. Moor ponds should be dragged in autumn or summer with a chain or heavy rope, to facilitate the rise of poisonous gases.

When the water freezes, the supply and discharge channels should be kept constantly open. If, however, the water supply is insufficient, it is necessary to try to get rid of the decomposition gases by dragging to and fro under the ice a so-called "Strohleine" (a rope furnished with wisps of straw at intervals of a yard). The rope can also be weighted and drawn along the bottom, so that the gases may rise and escape through the ice-holes. At the same time, the surface of the ice should be kept as free from snow as possible, so as to allow of the development of the small green algae and cause them to give off oxygen.

The appearance of different water insects in the open supply channel of the pond is a sure sign of the water becoming foul. First comes *Corisa*, which is followed soon by *Nepa cinerea* and *Notonecta glauca*. As the pond weeds on which these insects pass the winter have already decomposed, they seek oxygen in more wholesome waters. If no suitable remedy is found, during the next 24 hours *Ranatra linearis* makes its warning appearance. The advent of *Hydrophilus piceus* denotes that the greater number of the fish are congregated round the edges of the pond beneath the ice seeking in vain for water richer in oxygen and are destined there to perish miserably.

287 - Experiment in Feeding Carp on Acorns at Trachenberg, Germany.

HEROLD, R. Eichelfütterungsversuch in der Teichwirtschaft Trachenberg. — *Allgemeine Fischereizeitung*, Year 38, No. 3, pp. 60-61. Munich, February 1, 1913.

This experiment was made by the writer last summer. Carp, one summer old, were placed in a pond badly supplied with nutritive substances, and fed for three months exclusively upon crushed acorns. The fish remained healthy. They were weighed before and after the experiment.

Results: 8.85 cwt. of crushed acorns, costing 8*s.* 10*d.* delivered at the pond, produced 1.9 cwt. of fish for the table.

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

288 - Watzl's Regulator for Ploughs.

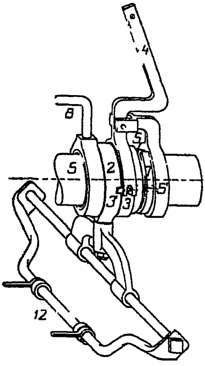
RIZEK, I and RICHTER, L. Pflugfuhrung Watzl. K k. Hochschule für Bodenkultur, Prüfungsstation für landwirtschaftliche Maschinen und Geräte.— *Wiener Landwirtschaftliche Zeitung*, Year, 63, No. 3, p. 27. Vienna, January 8, 1913.

The regulator for ploughs shown in the annexed figure is used as follows:

The hollow cylinder 5 is fastened by means of the set screw 8 on the more or less cylindrical beam of an ordinary plough, while the shackle 12 is fastened anyhow to the wooden or iron fore-carriage of the plough.

The regular working of the plough is based on the fact that the ring bearing 2, in which the above-mentioned hollow cylinder 5 is borne, being fixed to the fore-carriage, cannot revolve round the axis of the beam; and in the position shown in the drawing the rotation of the cylinder 5 (and consequently the rotation of the plough beam) is prevented by the ring 3 which works in the groove 5' of the cylinder 5 by means of the small springs 3' and is coupled to the bearing 2 by the butt ends of the springs 3' catching in a notch of the bearing 2.

This coupling of the ring 3 with the bearing 2 is maintained, while the plough is working, by the spring 7 which presses the ring 3 against the bearing 2. When the plough reaches the end of the furrow the lever 4 is pulled by means of a string, the other end of which is fastened to the handles, and overcoming the resistance of the spring 7 the ring 3 is pushed so far forward as to be released and free to turn with the hollow cylinder 5 and the whole plough beam. Thus the plough can be turned over as is usually done at the end of the furrow. When a new furrow is started the ring 3 couples automatically with the bearing 2.



Experiments have demonstrated that even imperfect wooden ploughs, or ploughs composed of parts not really belonging together, if provided with Watzl's regulator can be made to proceed as evenly in the furrow as the best modern iron ploughs, thus greatly facilitating the work of ploughing where modern implements have not yet been introduced.

The writers believe that this regulator can be still further simplified without impairing its efficiency.

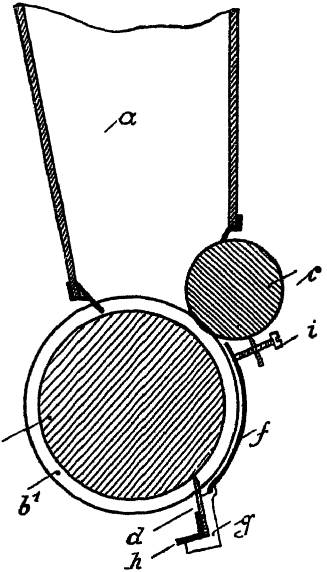
289 - Distributors for Solid and Liquid Manures.

Aus neuen Patent-Schriften. — *Landwirtschaftliche Maschinen und Geräte*, 12th Year, No. 32, pp. 21-22; 13th Year, No 1, p. 19. Artern, December 28, 1912, and January 4, 1913.

The essential merit of this machine, the subject of two patents in Germany, consists in the even distribution of manure. Figs. I and II show the distributor for solid manures, in which the uniformity of distribution is obtained by means of a concave case which covers the distributing roller from the point at which the fertilizer falls onto it from the hopper, to the scraper. The space between this case and the roller can be increased or diminished so that the quantity of manure can be regulated.

The manure in the hopper (*a*) falls on the grooves (*b'*) of the roller (*b*), by which it is carried to the scraper; this rubs off the manure which has been pressed into the grooves by the counter roller (*c*) and allows it to fall to the ground.

I



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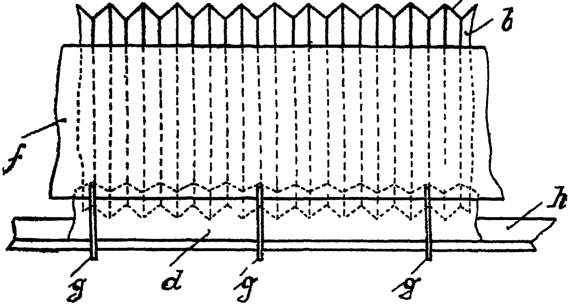

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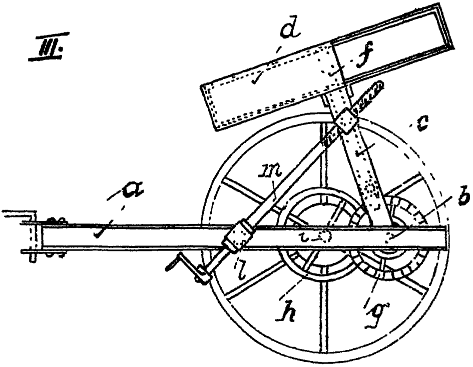

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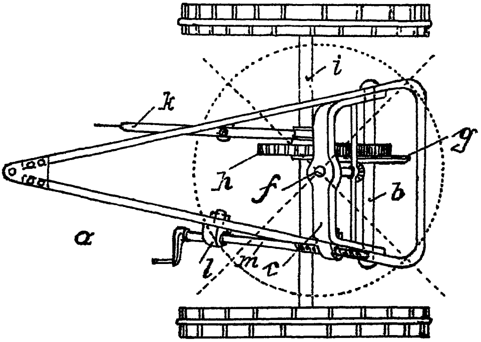


In the figure the case is shown in (*f*) and a bar of angle iron in (*h*). This bears an angle of sheet iron (*g*), to which the case is attached. The set screws (*i*) serve to regulate the position of the case.

Figs. III and IV show the distributor for *liquid manures*, in which the distributing disk can be given different degrees of inclination to the surface of the ground. This distributor consists of a frame (*a*) bearing a U-shaped support (*c*), which, by means of the shaft (*b*), pivots on the frame. It carries the shaft (*f*) of the distributing disk. This shaft is caused to revolve by the spurred gears (*g*) and (*h*), which are connected with the driving axle (*i*) and thrown into or out of gear by the lever (*k*). With the object of shifting the position of the support (*c*), a swivel bearing (*d*) in which a worm shaft works, is attached to the frame.

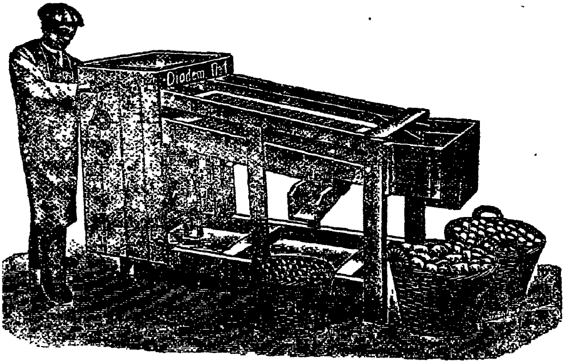
The worm shaft (*m*) is provided with a crank handle at its lower end and with a worm at its upper extremity working in a swivel nut (*o*) on the support. By causing the shaft (*m*) to rotate by means of the hand crank, the U-shaped support (*c*) turns on the shaft (*b*) and alters the inclination of the distributing disk. At the same time the worm shaft affords great stability to the support, which cannot shift by itself, and allows the disk and the gears to run smoothly.

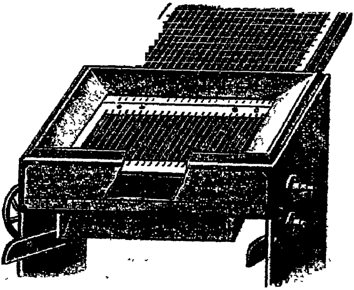
290 - Report of the Machine Experiment Station of the Agricultural Association of Prussian Rhineland on the Potato-sorting Machine " Diadem No. 1. "

GIESELER, E. Prüfungsbericht der Maschinenprüfungsstation des landwirtschaftlichen Vereins für Rheinpreussen über die Kartoffelsortiermaschine, " Diadem " Nr. 1. — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 9, pp. 102-103. Berlin, January 29, 1913.

The machine shown in the two annexed figures was tried twice. It is easily transportable, a strong boy can work it easily and its feed hopper is at a convenient height. Most of the earth falls before reaching the sorting sieves through a swinging screen at the back of the machine, and over a wooden gutter which at the same time protects the shaft and gearing. The riddles thus remain clean for a long time, unless the earth adhering to the potatoes is particularly sticky. The riddles are besides easy to clean and to change. Under normal conditions the machine grades about 5 tons of potatoes per hour, that is, as many as two workmen can feed to it. The potatoes fall well sorted into three grades into baskets. The construction of the machine is solid and durable, and the arrangements for lubrication are convenient.

The working of the machine is the following: By turning the crank handle a set of geared wheels transmits motion to a horizontal shaft which goes right through the wooden frame of the machine. In the middle, this shaft is bent to a crank bearing one end of a connecting rod, the other end of which is fastened to the lower screen, causing it to move forwards and backwards. The upper end of this screen is borne by two oscillating long wooden springs fixed to the lower bars of the frame, while its lower end is supported by the lower arm of a vertical lever pivoting round its centre. The upper arm of this vertical lever bears the lower end of the upper screen.





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The upper end of the upper screen is also supported by two oscillating wooden springs. By this arrangement the two screens move always in opposite directions and shocks are reciprocally neutralized.

291 – Trial of the Hand Power Separator "Lacta 2," of the Machine and Bridge-building Company, Helsingfors, Finland.

REZEK, I and WINKLER, W Prufung der Handmilchzentrifuge "Lacta 2" der Maschinen- und Bruckenbau- A.-G. Helsingfors, Finnland. K. k. Hochschule fur Bodenkultur. Prüfungsstation fur landwirtschaftliche Maschinen und Gerate. — *Oesterreichische Molkerei-Zeitung*, Year 20, No. 2, pp. 22-24 Vienna, January 15, 1913.

On the construction of the seperator under examination the following is to be noticed: The drum consists of two parts, united by a ring and rendered watertight by a rubber ring. The bottom of the drum, which is raised in the centre, ends in a hollow cylinder which receives the end of the spindle, and on which the drum rests in such a way that its centre of gravity is lower than its point of support; it can thus balance freely, while rotating, on the end of the shaft. For this object the spindle head is provided with a metal cap AC (see figs. 1 and 2) fixed to it by a pin, which causes it to revolve with the spindle, but allows it sufficient play room, while the outer surface of the cap fits tightly in the hollow space at the bottom of the drum. The central tube through which the milk is fed is placed immediately above the cylindrical part of the bottom of the drum, against which the tube ends in a foot plate with three channels by means of which the inflowing milk is led to the neutral zone. Next follow 22 metal cones placed one above the other which at the top completely enclose the central tube. The whole set of cones is pierced vertically in three points which allows the milk to ascend and to spread between the conical plates; besides which they have three smaller openings on their flattened upper edge in order to allow the cream to rise. The set of cones are at a distance of 4 millimeters from the side of the drum and are covered by a top cone which embraces the central tube by means of a strong cylindrical support, and bears on its flat edge inclined inwards two outlets for the cream, the openings of which can be regulated by means of screws. The skimmed milk issues by the three grooves in the cynlindrical support of the upper cone, which convey it over the edge of the drum cover above the upper cone, whence it flows by centrifugal force.

The bearing consists of a strong brass socket which surrounds the shaft and which in its turn is held by a strong spiral spring.

The gearing shown in fig. 3 presents two novelties for separators.

1. The usual simple spur wheels are replaced by skew wheels, which offer the advantage of diminishing friction and of working noiselessly.

2. The intermediate shaft of the drum shaft is connected with the worm gear on it by means of a spring friction coupling, and the play room of the spring against the intermediate shaft is so small that by the motion of this shaft in one or the other direction it is immediately and automatically thrown into or out of gear.

The power required to work this separator was calculated by means of an electric method and also by Leuner's spring dynamometer.

Altogether 10 tests were made with the separator, the results being tabulated in the paper. They show that working under normal conditions the amount of butter-fat remaining in the skimmed milk is only 0.09 per cent., which is a very good separation.

When the number of revolutions was diminished by about 20 per cent. the intensity of separation changed but slightly and was satisfactory also at the low milk temperatures of 20° to 23° C. (68 to 73. 4° F.), the fat content of the skimmed milk not exceeding 0.14 per cent.

The noise produced by the machine when at work is very slight. The design of the separator is simple and suitable and it is carefully constructed. It does not require any particular skill to dismount, to remount and to clean it, all of which can be done in a few minutes. In view of these results the separator was pronounced to be an excellent machine.

292 - A New Machine for the Extraction of Rubber from Bark.

JUMELLE, H. Une nouvelle machine pour l'extraction du caoutchouc des écorces. — *Le Caoutchouc et la Guttapercha*, Year 9, No. 106, pp. 6780-6783. Paris, December 15, 1912.

The extraction of rubber from bark by trituration is not to be recommended in the case of all rubber-producing trees, although it is an excellent method to apply to lianes in general and also to such trees as usually afford only small quantities of latex when tapped.

The writer describes a new machine, "la Valour," which allows of the operation being carried out more rapidly, regularly and completely than when the material is crushed by hand in mortars. The entire apparatus consists of an iron cylinder driven by some kind of motor. The necessary force is about 3 H. P. The cylinder, which is placed horizontally, is pierced with numerous holes. Inside are about fifteen strong rollers, each weighing 37½ lbs., and with a length almost equal to the cavity of the drum. These rollers are free, and when the drum moves at the approximate rate of 45 revolutions per minute, these bars of iron fall onto each other and also against the sides of the machine, acting in fact like the pestle in a mortar. If a certain quantity of bark is introduced into the cylinder it gets finely crushed. A stream of water, which passes through the perforations in the wall, removes the débris of the pulverised bark, while the pure rubber remains in the drum; it is then removed, carefully washed in hot water and formed into blocks by strong pressure. This machine can also work without water; in this case, the pulverised bark issues from the holes made in the drum for the purpose. The apparatus can be taken to pieces and thus transported on the backs of men or animals.

The cylinder is capable of containing 70 lbs. of bark. The block of rubber obtained in the course of an experiment made with the above weight of bark of *Landolphia Thollonii* represents 10 per cent. of the bark. It was of a maximum degree of purity, and only contained 1.15 per cent. of ash, which is much less than in the case of rubber obtained by tri-

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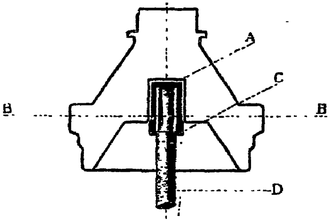

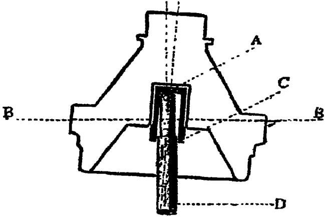

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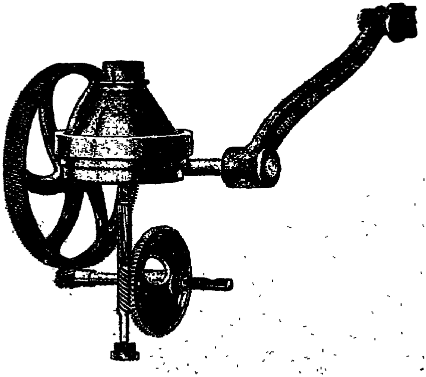

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turation, though it is a great deal more than results from the coagulation of the latex. The somewhat spongy appearance of the section of the block is due to the method of preparation and would become perceptibly less if the block were submitted to hydraulic pressure.

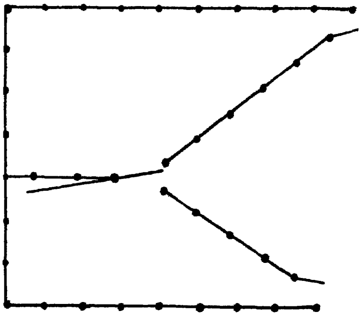
The writer considers that this machine produces in the minimum of time as fine and pure a rubber as can be obtained by trituration. This is all that can be expected, as this kind of rubber is one which can only be obtained by this direct extraction.

293 - A Cutting-Out Gate for Hogs.

BUILDING-CONSTRUCTIO

KORTE, H. A. in *The Breeder's Gazette*, Vol. LXIII, No. 2 (1624), p. 79. Chicago, January 8, 1913.

As shown in the annexed figure, two wings of fence lead up to the opening for the cutting-out gate. This opening is 2 feet wide. The gate is 4 ft. wide and hangs on a post, as on a pivot, so it swings easily from side to side of the 2 foot opening. From the top of the gate a pole extends backwards about 12 feet, by which the gate is swung. It should be far enough back that as the animals approach the gate they will not be frightened by the man who stands there to work it.



This is a simple device and not expensive and has been found a great help in practical use in separating hogs.

RURAL ECONOMICS.

RURAL ECONOMICS

294 - Grazing or Stall-Feeding on High-Moor Farms.

SOBOTTA. Die Zukunft im Hochmoor, Weidewirtschaft oder Stallfütterung? — *Fühlings Landwirtschaftliche Zeitung*, Year 61, Part 24, pp. 826-852. Stuttgart, December 1912.

Owing to the good water supply on high-moors, the owner of the smallest farm in these districts has free choice in the selection and distribution of his cultivation methods and can plough the land or lay it down to grass, as best suits the size and requirements of his property. Meadow and pasture cultivation on the high-moors has made considerable progress of late years. High-moor pastures give as good a yield of grass as marsh pastures and even proved superior to the latter in the droughty year 1911. The average hay crop per acre on the high-moor meadows is reckoned at 2 tons, and the average increase of live weight of cattle on the pastures at 262 lbs. per acre. The value of the yield of an acre of meadow land is: 2 tons of hay at £3 = £6; and that of pasture land is: 262 lbs. increase of live-weight at about 5*d* = £5 5*s*. As the extra value of the hay crop is counterbalanced by the higher cost of labour, the yield of meadows and pastures is about equal; thus if the question of returns is to decide the matter, there is nothing to choose between them.

The high-moor can therefore provide grazing land as well as hay to supplement stall-feeding. Thus the high-moor farmer can turn his attention to pasturage and fattening and breeding cattle in the open, or he can stall-feed the animals, either for the butcher or for dairy purposes. He can also select a middle course combining both methods.

In order to show that the two types of farming are equally remunerative, the writer cites the examples of two farms of the Wörpedorf High-moor Colony on the Teufelsmoor in the district of Osterholz in Hanover. These farms are numbers 42 and 33 Wörpedorf. The areas under cultivation on the two farms are divided as follows:

	Worpedorf 42 — acres	Wörpedorf 33 — acres
Arable	13½	14
Meadow	13½	18
Pasture	13	3
Total area under cultivation	40	35

Thus on W.42 the proportion between arable land, meadow and pasture is 1 : 1 : 0.95, and on W.33, 1 : 1.29 : 0.22. These figures clearly show the difference between the systems of the two farms: W.42 is a typical high-moor farm, divided equally into arable land, meadow and pasture; on W. 33 there is relatively little pasturage, so that stall-feeding is indicated for the cattle there.

A comparison of the receipts and expenditure of both farms gives further differences which result from the two systems in the sale and purchase of cattle, sale of products, purchase of foodstuffs and manure, etc.

a) *W*. 42.

Receipts.	£	*s.*	*d.*
1. 221¼ cwt. of potatoes at about 2*s*.	22	0	0
2. 61½ qts. of milk daily (carriage deducted) at 7½*d*. per gal.	172	17	6
3. 2 in-calf heifers and 2 discarded cows at £22 1s	88	4	0
4. 4 calves at £4 18*s*.	19	12	0
5. 80 fat pigs of 200 lbs. at about 50*s*. per cwt.	352	16	0
6. 12 700 cub. ft. of peat	88	4	0
7. ;Pasture rent for outside cattle	4	3	0
8. Sundries, garden, poultry, letting out vehicles.	8	16	6
Total . . .	£756	13	0

Expenditure.	£	*s.*	*d.*
1. 2 cows (substitutes) at £22 1*s*.	44	2	0
2. 90 young pigs (substitutes) at 11*s*. 9*d*.	52	17	6
3. Depreciation of 2 plough horses, worth £29 7*s*. 6*d*. each, at 10 %	5	17	6
4. *a*) Crushed barley and fodder meal	205	15	0
b) Brewer's grains	20	11	0
5. Seeds	4	17	6
6. Chemical manures	14	12	6
7. Wages :			
a) farm servant: wages £24 10*s*.; keep £19 15*s*.	44	5	0
b) day labourer: 150 days at 2*s*. 6*d*., 150 days at 1*s*. 3*d*	27	15	0
c) maid: wages £8 16*s*. 6*d*.; keep £15 16*s*.	24	12	6
d) Piecework in turf-cutting, harvesting, and like expenses	39	5	0
8. Rent of meadow	1	0	0
9. Depreciation of buildings, worth £490, at 5 %	24	10	0
10. Depreciation and maintenance of live and dead stock	24	10	0
11. Insurance premiums, various expenses, risk.	68	12	0
Total . . .	£603	2	6

The receipts thus exceed the expenditure by £153 10*s* 6*d*. If the value of the work done by the farmer and his wife is taken to be worth £53 5*s* + £26 10*s* = £ 61 15*s*, a net revenue of £91 15*s* 6*d* is gained; at 5 per cent. this represents a capital of £1835 10*s*, while the owner according to his books valued his property and his stock at £1702 7*s* 6*d*.

b) *W*. 33.

Receipts.	£	*s.*	*d.*
1. 236 cwt. of potatoes	23	10	0
2. 26 gallons of milk daily at 6¼*d*.	296	7	0
3. *a*) 4 cows at £23 10*s*.	94	0	0
b) 2 fat bullocks at £24 10*s*.	49	0	0
4. 10 calves at £4 18*s*.	49	0	0
5. 80 fat pigs at about 50*s*. per cwt.	352	16	0
6. 17 000 cub. ft. of peat	117	12	0
7. Leasing of buildings and land	9	16	0
8. Sundries, garden, poultry, letting out vehicles	8	16	0
Total . . .	£1000	17	0

Expenditure.	£	s.	d.
1. *a*) 4 in-calf cows at £24 10*s*.	98	0	0
b) 2 bullocks for fattening at £12 5*s*.	24	10	0
2. 90 young pigs at 11*s*. 9*d*.	52	17	6
3. Depreciation of 2 ploughing horses, 10 % on £58 15*s*.	5	17	6
4. Feeding stuffs	382	5	0
5. Seed	7	7	0
6. *a*) Chemical manures	4	18	0
b) Pig dung	2	9	0
7. Labour :			
a) 2 farm servants at £44 5*s*.	88	10	0
b) 1 maid	24	12	0
c) Labour for cutting peat ; harvesting, etc.	44	2	0
8. Rent of meadow	2	0	0
9. Depreciation of buildings, worth £656 10*s*., at 2 %	13	2	6
10. Depreciation and maintenance of live and dead stock	24	10	0
11. Insurance premiums, various expenses and risk	68	12	0
Total . . .	£843	12	6

These receipts thus exceed the expenditure by £157 4*s* 6*d*. If the labour of the farmer, his wife and mother are valued at £35 5*s* + £26 10*s* + £13 5*s* = £ 75, there is a net revenue of £82 4*s* 6*d*, which, at 5 per cent., represents capital to the amount of £1644 10*s*.

This comparison clearly shows that two neighbouring high-moor farms, of which the conditions are similar, can develop very differently and yet give the same results from the cultural and the financial point of view.

The simplicity of the management, the little labour required, the few agricultural risks and the relatively more certain previsions, are all factors which incite the farmer who has learnt what hard work is involved in moor farming, to imitate the marsh farmer in depending chiefly on pasture, especially since good and remunerative pasturage can be established on high-moors. The weak side of this system is less apparent. Where pasturage is the chief industry of the farm, it is very difficult to keep the cattle intended for fattening through the winter and to obtain sufficient animals to fill up the vacancies, when it is desired to use home-bred cattle of which the disposition and qualities are well-known. To provide for these animals throughout the winter entails the purchase of large quantities of concentrated food ; this makes the profits accruing from the system very doubtful.

To these difficulties must be attributed the general division of stock-raising labour between the east and west districts in Germany. The animals bred on the western pastures — cows in calf, heifers and young cattle —, which have to be removed at the close of the grazing season, mostly find winter quarters in the eastern provinces, especially on estates where agricultural industries are carried on (distilleries, factories of starch and sugar). The landowners of the eastern provinces often find it difficult to keep sufficient cattle during the winter to utilize the waste products from the factories, as the extent of pasturage is not great; on the other hand, a farm which devoted a large area to the cultivation of fresh fodder would not be profitable.

From the standpoint of national economy, this division of labour is most important, as the production of meat is thereby regulated. The pasture farms furnish the greater part of the butcher's beasts from late summer (August) to the end of autumn, while the winter-feeding farms supply beasts from December on into summer. The annual meat supply is thus conveniently apportioned and great fluctuations in price are avoided.

During the last few years, large areas in the eastern districts have been laid down to pasture, especially in parts where extensive low-lying moors occur. Thus the east will in the near future be independent as regards obtaining young cattle and butcher's beasts in the summer. If the western districts devote themselves continually more exclusively to maintaining extensive pasture-farming, to the exclusion of stall-feeding, this will lead on the one hand to ill- timed overproduction and on the other to a rapid decrease in the supply, with the result that there will be a great disproportion between the supply and demand and much fluctuation in the prices on the cattle market. Thus from the point of view of national economy, it is necessary to determine the purpose to which the high-moors are to be put, seeing that there are still extensive moorland tracts uncultivated in Northwest Germany.

High-moors combine the most suitable conditions for grazing and for stall-feeding. They can be cultivated to raise not only cereals suitable for bread-making, but also hay and root crops sufficient to form a good basis for winter feeding. It must be remembered that a stock-raising farm can only prosper if the crops and meadows provide the whole winter fodder supply. So far, the labour question has given no trouble; in fact as the farms are on an average only 27 acres in extent, the farmer and his family are able to do all the necessary work. In such farms under extensive cultivation, the brothers and grown-up sons of the proprietor cannot eventually find steady and remunerative work upon it and, like other members of the household will be driven to seek employment in town industries.

Purely extensive cultivation, even over large areas, can only provide food and lodging for a relatively small number of people. But a system of farming which includes tilling arable land and keeping cattle in the open and the stall, better promotes the circulation of large quantities of articles of food (grain, potatoes, milk, meat) than a system which is based upon grazing and where the whole aim is limited to the production of meat.

From what has been said, it is evident that the best way of cultivating high-moors is to divide them equally and systematically into arable fields, meadows and pastures.

295 – The Profitableness of Artificial Manuring.

Die Rentabilität der Kunstdüngung. — *Land- und volkswirtschaftliche Mitteilungen*, Year XXXI, No. 2, pp. 19-20. Linz, January 15, 1913.

The bookkeeping and farm department of the German section of the agricultural council of the Margravate of Moravia, under the direction of

Dr. Ostermayr, has, by means of careful bookkeeping in a number of Moravian peasant farms, established the profitableness of using artificials. For this purpose the farms were divided into five groups :

Group I. Farms which use nitrogenous, phosphatic and potash manures.

Group II. Farms which use nitrogenous and phosphatic manures but no potash.

Group III. Farms which use phosphatic and potash manures but no nitrogenous manures.

Group IV. Farms which use only phosphatic manures.

Group V. Farms which do not use artificials at all.

Complete manuring exerted the greatest influence on cereals. The heaviest crop was 1568 ½ lbs. (26.1 bushels per acre), and it belonged to group I. From group I to group V the amount of crop harvested diminished steadily. Among cereals, rye and oats followed regularly this order, while the heaviest wheat crop was met with in group IV (exclusively phosphatic manure), and the heaviest barley crop in group II (phosphoric acid and nitrogen). It follows that rye and oats have by far the greatest need of plant food, while wheat and barley, which occupy a better place in the rotation in regard to dressings of dung, and, owring to their requirements, are grown on better soil, show less sensibility to the action of artificials.

The fact that the lowest returns per acre are recorded in group V, the one without artificials at all, proves that the use of artificials is a determining factor in the increase of returns. A comparison with group IV shows that it is especially a question of the supply of phosphoric acid. Dr. Ostermayr believes accordingly that the intensive use of this plant food can be unhesitatingly recommended to every Moravian farmer.

The net returns per acre were as follows :

Farms that did not use phosphoric acid	£1 15*s* 8*d*
" " " " nitrogen	£2 8*s* 2*d*
" " " " potash	£2 15*s* 6*d*

Consequently the least reliable in their effects on the increase of net returns are the potash manures.

Dr. Ostermayr also grouped the farms according to the quantities of the various artificials employed, and found that an increased consumption of nitrogen and phosphoric acid has the effect of increasing the net returns, but that the reverse is the case with potash manures : the more considerable the quantity of potash given, the lower the net returns. From this observation it does not follow that manuring with potash is never attended by success, but that the most advantageous quantities of manures to be employed, and especially of potash manures, must be determined in each farm by means of careful experiment.

296 - Cost of Making Beef.

The Breeder's Gazette, Vol. LXIII, No. 2 (1624), p. 81. Chicago, January 8, 1913.

The lot of oxen which was exhibited at the International Exhibition of 1912 in the short-fed class and won championship honours were treated as follows:

On Feb. 3, 1912 these cattle, weighing 950 lbs. each, were purchased at $ 5.25 per 100 lb. and were fed no grain before August 12. From February 3 to April 10 the feed consisted of rather coarse timothy hay and the fodder taken from about 2 ½ acres of corn. On April 7 the cattle were turned on 60 acres of good bluegrass pasture with a good deal of old grass left from the previous season. Here they remained without any additional roughage until August 12. Two snow storms during April made it necessary to bring the cattle up to feed for a few days. On August 12, after twelve hours off feed and water the eighteen steers averaged 1 208 lbs., showing a gain of 258 lbs., since February 3. During the first 60 days of the feeding period, the cattle had access to 40 acres of pasture from which a crop crop of hay had been taken, and the grain consisted of cracked corn, spelt and oil meal. A full feed was reached in about two weeks and practically no steers went off feed. If they showed an inclination to loss of appetite, molasses feed was added to the ration. The gradual change from old to new corn commenced on September 16. During the last thirty days, the cattle received 5 ½ lbs. of oil meal per head per day.

Complete figures follow.

Cost up to August 12.		
18 steers, av. 950 lbs. at $5.25	$	897.84
2 ½ acres corn fodder at $20 per acre	”	50.00
10 tons hay at $10 per ton.	”	100.00
60 acres pasture at $4 per acre	”	240.00
Interest on investment at 6 per cent	”	53.87
Total . . .	$	1 341.71
Feed bill August 12 to November 30.		
52 bu. spelt at 30 c. per bu.	$	15.60
4 tons oil meal at $33.50 per ton.	’	134.00
335 bu. cracked corn at 75 c. per bu.	”	251.63
587 bu. new corn at 40 c. per bu.	”	234.90
1 ½ ton molasses feed at $26.50	”	39.75
Pasture, August 12 to October 10	”	20.00
1 ton alfalfa hay at $16 per ton.	”	16.00
Corn stover	”	10.00
Total cost to November 30 . . .	$	2 063.59
Proceeds.		
15 steers, 22860 lbs. at $10.70	$	2 446.02
3 steers, 4 660 lbs at $10.75	”	500.95
Total . . .	$	2 946.97
Commissions and charges . . .		131.00
Net proceeds	$	2 815.97
Premium won	”	300.00
Total . . .	$	3 115.97
Cost	”	2 063.59
Net profit . . .	$	1 052.38

297 - Land Valuation.

EICHHOLTZ, TH Bodenschätzung — *Deutsche Landwirtschaftliche Presse*, Year XXXX, No. 7, pp 73-74; No 8, pp 83-84 Berlin, January 22 and 25, 1913

After a short explanation of the terms: value based on net returns, farming value and common value of land, and of the connection between them, the writer discusses the question of valuation in the rounding up of estates by exchange (Zusammenlegungsverfahren). The general commissions still practise the exchange of pieces of land in the rounding up of properties according to the values based on returns. According to the writer the chemical properties of the soil and the distance from the farm houses do not receive sufficient consideration from this method of valuation. A further inconvenience is that complaints against the distribution of the pieces of land are again judged according to the same principles which gave rise to the complaints.

These evils could easily be avoided if the soil were examined according to the geologico-agricultural maps and if the market value were considered as the measure of value in these exchanges. This latter would contain in itself the distance, the position, the agricultural and technical possibilities, and all the other properties of the soil that determine its value.

The valuation of land must take into consideration two principal factors, namely that the agricultural value of the new pieces of land should be in just proportion to that of the old ones, and secondly that the personal property of the owner, expressed in common value, should suffer no loss.

According to the data furnished by the chief land surveyor Ammon in the third report (1912) of the Bavarian Flurbereinigungskommission, the most desirable land valuation, from a theoretical point of view, would be the one which would contain in one single number all the factors which determine the current value of the piece of land, in just proportion to all the other pieces in the region undergoing the rounding off of properties by means of the exchange of outlying fields. A valuation in figures which omits any factor determining the value and does not consider it in some other way in the exchange of fields, cannot satisfy the condition that every one who takes part in these exchanges must receive full compensation for the land he gives up.

If use is made of the market value in such valuations, it is obvious that the same market value cannot be used throughout the whole operation, for with the new arrangement a new market value arises. This value is called by the writer the transition value. This transition value, even after deduction of the contributions for works made in the common interest, such as roads, ditches, etc., will be higher than the original value of the old field. As this difference in value is divided equally among all who take part in this exchange, which with the present way of proceeding is the case only to a small extent, the equity of the method will be recognised by the landowners and their confidence in it will increase. It is only this method, allowing the increase in the value of the land to be expressed in figures, which can give a just measure for the division of the cost of the operation.

In valuing according to the market value, it is to be noted that the market value V consists of the product of the geological-agricultural-geographical value G, by the factor of the vicinity to the farm buildings N, and by the farming power of the owner, O; therefore:

$$V = G \times N \times O; \text{ and } G \times O = \frac{V}{N}$$

In purely agricultural districts O, (excepting on leased lands) may be considered as almost everywhere having a constant value. Where, however, industrial influences or the neighbourhoad of building sites act upon the value of the soil, a new factor I appears; consequently $V = G \times N \times O \times I$, and in plotting the values on the maps the influence of the factor I will show in belts about the value $G \times N \times O$. The determination of these belts is very important, both for the rounding up of properties and for expropriations. By means of this method, the value of the influence of industrial centres I may be calculated, as $I = \frac{V}{G \times N \times O}$; and with the help of this the difference between the industrial and the purely agricultural value of the plots of land is found.

In determining the market value of land, in spite of the abundance of available material for comparisons, errors can easily be committed: but they are not errors of principle like those which are committed in the valuation according to returns and which will be repeated by the commission of appeal following the same principles, which the landowners do not under stand. The errors which may be made by the first method are such as are easily recognized by the landowners, and it therefore seems advisable to adopt everywhere the valuation made by the owners themselves.

If, in taxing agricultural land, its market value were taken as a basis, a good deal of inconvenience would arise: where for instance the industrial factor I has considerably increased the value of land, farming would no longer be able to pay the interest upon it, and under certain conditions would cease altogether. In order to remedy this inconvenience, the factor I can be calculated and subtracted from the market value. The purely agricultural value would thus be obtained and this only should be conditionally taxed. The exemption from taxes on the value I ought to be entered in the land register, under the condition that the difference in the tax will be paid with compound interest by the land owner or his heirs when the land in question is be built over or used for industrial purposes. In this way valuation according to market value would not increase the burthen of taxation on farms, but would be a bar to unwholesome speculation and a protection to agriculture and to public health in the neighbourhood of towns and of industrial centres.

The writer expresses the wish that in the new valuations for taxation, the market value of an extensive purely agricultural district be ascertained as well as the present sum of taxes on returns for the same area. This latter sum should then be distributed according to the market value, so that the total burthen would not change but be better distributed.

The agricultural improvements carried out by owners should not be taxed until the land changes hands. The sites of buildings and the house gardens should pay land-tax and not house-tax.

The application of valuation according to this system requires on the part of the State geologico-agricultural examinations of the soil on an extensive scale, as well as the determination and control of the valuation itself. This ought to be the duty of the valuation division of the land office which the writer desires to see established.

AGRICULTURAL INDUSTRIES.

DAIRYING

298 - Variations in the Composition of Whole Milk used in Cheese Making.

KOSTLER, G. Schwankungen in der Zusammensetzung ganzer Kasereimilchen. — *Schweizerische Milchzeitung*, Year 39, No. 9, p. 1. Schaffhausen, January 1913.

In dairies, where milk from various sources is used, adulteration of the collected milk may occur, and is very difficult to prove scientifically on account of the large quantities dealt with. If, for instance, 10 lbs. of 25 per cent. cream are taken from 1000 lbs. of milk, the fat content is only decreased about 0.2 per cent. The question is now whether a difference of 0.2 per cent. in the fat content of collected milk is a normal variation or not. To find an answer to this query the writer has investigated the composition of the milk used at two cheese dairies every day for a fortnight. The results are given in the following table :

Milk A (1). Morning-milk.				Milk B (2). Evening-milk			
January 1913	Fat %	Total solids %	Solids not fat %	January 1913	Fat %	Total solids %	Solids not fat %
4	3.70	12.87	9.17	5	3.79	13.00	9.21
6	3.69	12.91	9.22	7	3.86	13.01	9.15
8	3.62	12.78	9.16	9	3.79	12.88	9.09
10	3.74	12.79	9.05	11	3.78	12.90	9.12
12	3.88	13.04	9.16	13	3.82	12.99	9.17
14	3.79	12.98	9.19	15	3.79	12.83	9.04
16	3.74	12.79	9.05	17	3.77	12.85	9.08

(1) From 11 farmers with 150 cows.
(2) From 28 farmers with 200 cows.

The specific gravity at 15° C. varies from 1.0319 to 1.0329.

Conclusions. — A difference of 0.2 per cent. in the fat content of upwards of 200 gallons of mixed milk is suspicious ; variations less than this, considering the taking of the samples, cannot be taken to show that any cream has been removed.

299 - The Preservation of Milk Samples for Analysis.

DENIGÈS, G. La conservation des échantillons de lait destinés à l'analyse. — *Annales des Falsifications*, Year 5, No. 50, pp. 559-561. Paris, December 1912.

The most effective chemical for preserving milk is carbolic acid ; 50 gr. of this are disssolved in 10 cc. of a 95 per cent. solution of alcohol, and 1 cc. of this mixture suffices to preserve 100 cc. of milk. The composition of the milk can be tested in the usual manner as well after this addition as before. Experiments on this subject were made by the writer and M. Dubois with the following results :

Milk No 1.

	Fresh milk (April 20) —	Same milk + carbolic acid (May 25) —
	gr. per litre	gr. per litre
Acidity	2.70	2.70
Milk sugar	47.49	47.45
Fat	30	30
Casein	32	32
Ash	6.3	6.80
Solids	120.5	120

Milk No. 2.

	Fresh milk (May 17) —	Same milk + carbolic acid (June 3) —
	gr. per litre	gr. per litre
Acidity	1.80	1.80
Milk sugar	46.85	46.80
Fat	38.12	38.10
Casein	32	32
Ash	6.80	6.80
Solids	126	126

Milk No. 3.

This milk was investigated fresh in 1900, then preserved with carbolic acid and analysed 10 years later. Its composition was as follows :

	1910 —	1900 —
	gr. per litre	gr. per litre
Acidity	1.85	1.80
Milk sugar (anhydride)	46.40	46.85
Fat	37.90	38.12
Casein	32	32
Ash	6.75	6.80
Solids	126.40	126

300 - A Biological Method of Testing the Quality of Milk,

PARASCHTSCHUK, S. Biologische Untersuchungsmethode für die Gute der Milch — *Milchwirtschaftliches Zentralblatt*, Year 42, Part 3, pp. 65-69. Hannover, February 1, 1913.

The species of lactic acid bacteria present in milk vary according to its quality. The time which is required to coagulate milk and the characteristics of the coagulum differ according to the species of bacteria present; the writer has made use of the different physiological behaviour of the lactic acid bacteria for determining the quality of milk. employing the following species : Danish *Streptococcus*, Jaroslav *Diplococcus*, *Bact. Güntheri*, Russian *Streptococcus* and *Bac. bulgaricus*.

The investigations were carried out in the following manner : the milk was first sterilized and then inoculated with 1 to 2 per cent. liquid cultures (in which each species was equally represented) and placed in a thermostat at a temperature of 32° to 36° C.

The time needed for coagulation was registered and the bacteria present were examined and were as follows :

Milk	Coagulation time	Quality of coagulum	Preponderant species of bacteria
Very good. . . .	5-6 hours	fine and of good flavour	Danish *Streptococcus*, Jaroslav *Diplococcus*, *Bact. Güntheri*.
Good-average. . .	5 7 hours	thinner, flavour good	Jaroslav *Diplococcus*, *Bact. Güntheri*, Russian *Streptococcus*.
Bad.	More than 8 hours	tenacious	Russian *Streptococcus*, *Bact. bulgaricus*.

301 - Whey Lemonade.

BURRI, R. Die Molkenlimonade. — *Molkerei-Zeitung*, Year 27, No. 5, pp. 81-82. Hildesheim, January 17, 1913.

The latest product of the milk industry is "whey lemonade" made by Sterli of Basle from cheese-factory whey, which is poor in protein. (Application for patent is announced). This liquid, which is perfectly clear and keeps for several weeks, is of a greenish colour, but this is lost if the bottles are kept exposed to the light. The gas consists of small vesicles, as is the case with ordinary lemonade, and the taste slightly resembles that of milk which has been a little overheated (boiled taste).

The chemical composition of the beverage varies according to the whey (acid or rennet whey) and the method of cheese manufacture. In addition to the milk constituents (milk salts, sugar and acids), cane sugar is also present, as well as the carbonic acid introduced by pressure. Samples examined by Dr. Köstler-Rütti and the writer show the following proportions :

1. Acidity after removal of the carbonic acid	16.2 — 26.0 °
2. Nitrogen as protein	0.2 %
3. Cane sugar	5.6 — 5.9 %
4. Milk sugar	1.37 — 3.29 %
5. Ash	0.47 — 0.64 %
a) Lime, CaO	10.3 — 23.79 %
b) Phosphoric acid P_2O_5	15.52 — 18.5 %

The nutritive value of whey lemonade is higher than that of essence lemonade ; it also renders unnecessary the use of expensive sour milk preparations (yoghurt) in combatting inflammation of the intestines. When pasteurized, this lemonade is germ-free and is especially suitable for milk cures.

When whey is cheap and lemonade dear, the manufacture of whey lemonade promises to be a lucrative subordinate industry, especially in the case of city dairies where cheese is made.

302 – The Determination of the Water Content in Cheese.

NOCKMANN, ELSE. Zur Bestimmung des Wassergehaltes im Käse. Mitteilung aus dem chemischen Untersuchungsamt der Stadt Breslau. — *Molkerei-Zeitung*, Year 27, No. 2, pp. 1-2. Hildesheim, January 8, 1913.

Hitherto the amount of water in cheese has been determined either by drying the latter over sand, or by direct desiccation in a platinum vessel. As the two methods give the same results, the writer gives the latter the preference on account of its greater simplicity.

Another process was recommended by L. Mai and E. Rheinberger on the occasion of the chief meeting of the Union of German Food-Analysts. This was based on the principle of estimating the water by distillation with a liquid boiling at above 100°C., which does not mix with the water and thus allows of the direct estimation of the amount of the latter distilled. Petroleum is recommended as the most suitable distillation substance.

The writer has tried this new method on 20 different samples of cheese and compared it with the desiccating process in the platinum dish. She made triplicate estimations in both cases. The apparatus used in the distillation was that designed by L. Mai and supplied by Lautenschläger of Munich.

Results. — The estimation of the water by distillation was carried out in duplicate, and the determinations were on the average closely concordant. There were, however, some isolated cases where great differences were observed, as 0.52 per cent. in the case of a Swiss cheese and 0.57 per cent. for a Harz cheese. This may, however, be due to the difficulty in obtaining a homogeneous average sample of Harz cheese, as well as to the usual methods employed in making many cheeses. A comparison of the averages obtained by both methods showed that somewhat higher figures were obtained by distillation. Further tests were made with the idea that water might also be present in the petroleum, but there was no difference in the results. In a third of the samples tested, the difference between the two methods was less than 0.5 per cent., that is below the limit of error allowed in duplicate determinations, and in the case of nine samples, the difference was less than 1 per cent. The highest deviation was shown by Swiss cheese, being 1.87 per cent. It was particularly stored, ripe kinds of cheese which showed the differences with the different methods. This is possibly due to the formation, during keeping and ripening, of many volatile substances capable of distillation at high temperatures. It may also be that this cheese, on account of its stiff consistency, does not part with all its water when dried in the oven.

Summary. — The distillation method deserves preference from taking less time. It is also easy to carry out and saves weighing. As, however, not inconsiderable differences may arise from the use of the two methods, it is necessary, in order to obtain uniform results at all experimental stations, that one or other should be officially adopted.

MEAT INDUSTRY

303 - A Contribution to the Question of the Physiological Occurrence of Bacteria in Sound Meat.

GRUNT, OTTOKAR. Beitrag zur Frage des physiologischen Vorkommens von Bakterien im Fleische gesunder Schlachtrinder. — *Zeitschrift für Fleisch- und Milchhygiene*, Year XXIII, Part 9, pp. 193-207. Berlin, February 1, 1913.

The writer reviews the investigations of other experimenters respecting the germ content of meat and then describes his own work on this subject, which he undertook for the purpose of finding further principles for the bacteriological inspection of meat in slaughterhouses. He found amongst other things that bacteria placed on the outside of the meat very quickly penetrated into it. This he attributes to the mechanical effect of the meat (pressure), which either directly causes the entrance of the bacteria, or brings it about indirectly by the expression of the meat-juice, which, on the cessation of pressure, is drawn into the meat again, taking the bacteria with it.

The results of the work are as follows:

1. In the flesh of sound slaughtered animals no bacteria occur physiologically.

2. As in practice outside infection of the meat is unavoidable, meat destined for consumption necessarily contains a certain number of germs.

3. To prove conclusively the presence of bacteria in meat, it is necessary to examine larger pieces (if possible enclosed in connective tissue), and to allow of the development of any microorganisms present, which necessitates the use of incubators.

4. The postmortem entrance of bacteria into the interior of the meat follows, especially after any mechanical injury, so quickly that surface sterilization is generally too late.

5. In contradistinction to the flesh, the lymphatic vessels of sound cattle often contain bacteria.

304 - The Pork Trade in the Argentine.

RICHELET, JUAN E. Decadencia de la industria de preparados porcinos. — *Revista de la Asociación rural del Uruguay*, Year XLI, No 11, pp. 806-810. Montevideo, November 1912.

In the Argentine Republic about 10 million acres of land are annually sown to maize and their production is upwards of 8 million tons; this and a portion of its great production of wheat, oats, and linseed might be devoted to the raising and fattening of live stock, and altogether the conditions for pig breeding and the pork industry seem very favourable. Nevertheless, the former is carried on to a very limited extent and several attempts made to establish the latter have failed.

The writer examines the causes of these failures and suggests remedies, among which he places the better utilization of the offals.

Since 1900 the importation into the Argentine of prepared pork has constantly increased, whilst the exportation has diminished, and in 1912 it was almost nil. The figures in the annexed table are taken from the national statistics.

The value of the imports of pig products reached £140 331 in 1911, as compared with £104 093 in 1910.

	Quantities		Values			
	1911	Difference compared with 1910	1911		Difference compared with 1910	
	lbs.	lbs.	£	s	£	s
Importation:						
Salt pork	2 141	+ 963	24	10	+ 172	11
Canned pork	415 441	+ 89 694	18 687	3	+ 4 034	9
Sausages	697 778	+ 7 828	44 362	16	+ 743	1
Hams	1 671 598	+ 33 384	75 191	8	+ 15 385	2
Bacon	20 027	+ 8 320	720	15	+ 182	16
Lard	74 388	+ 22 154	1 338	11	+ 398	13
Exportation:						
Live pigs	—	—	17	17	+ 11	18
Cold-stored pork	2 227	— 2 227	—	—	— 29	19
Bacon	—	— 38 757	—	—	— 1 478	0
Lard	17 877	— 17 773	321	17	— 319	10
Bristles	69 714	+ 58 691	250	18	+ 211	5

WOOL INDUSTRY

305 - Wool from Cyprus.

Bulletin of the Imperial Institute, Vol. X, No. 4, pp. 537-539. London, December 1912.

Sheep-raising is an important industry in Cyprus, large numbers of sheep being killed annually for local consumption ; the wool produced is exported chiefly to France and Italy. The exports of wool were 4851 cwt., valued at £11 216, in 1909, and 6596 cwt., valued at £15 203, in 1910. (No further statistics are available). The total number of sheep in the Island in 1910 was about 400 000 (1). The wool is of inferior quality; this is partly due to the breed and partly to the conditions under which the sheep are kept. Attempts have been made by the Agricultural Department to impress on the native breeders the necessity of keeping the sheep well fed, and experiments have been carried out at the Athalassa Experimental Farm for the purpose of demonstrating the advantages of careful rearing. In the annexed chart are enumerated the results of the examination — at the Imperial Institute of London — of the shoulder wool of two fleeces — a yearling ram (No. 1) and a yearling ewe (No. 2) — received from the Athalassa Farm. The experts stated that the fleeces represented an excellent class of carpet wool, and valued No. 1 at 9*d.* per lb. and No. 2 at 8*d.* to 8½*d.* per lb. in London (May 1912).

Chemical characters

	No. 1 %	No. 2 %
Moisture	10.9	10.3
Grease	1.0	1.8
Matter soluble in water	2.1	3.3
Matter insoluble in water	1.2	3.2
Pure wool fibre . .	84.4	81.1

Physical characters

		No. 1 —	No. 2 —
Average tensile strength gr.		36	52
Average elongation before breaking . .	%	36.8	39.8
Length of fibres * . .	in.	1-18	1-18
Diameter fibres. . .	in.	0.0019-0.0040	0.0016-0.0035
Average diameter . .		0.0024	0.0025

* These figures represent the range of length in the fibres over the whole fleece.

SUGAR INDUSTRY

306 - The International Commission for Uniform Methods of Sugar Analysis in the Meeting held at New York on September 10, 1912.

WIECHMANN, F. G. in *The International Sugar Journal*, Vol. XV, No. 69, pp. 7-9. Altrincham, England, January 1913.

In the meeting held at New York on September 10, 1912 the International Commission for Uniform Methods of Sugar Analysis again expressed its opinion that " the official polarizations of raw sugar products shall be made exclusively at the normal temperature of 20° C., the presence of invert sugar and other impurities precluding the use of formulae and tables which have been elaborated for correcting the polarization of pure sucrose for changes of temperature."

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(1) In 1909, 301 699 sheep and 277 357 goats. — *The Statesman's Yearbook for* 1912, p. 115. London. (*Ed.*).

The wish was expressed that "the various countries may prescribe a uniform temperature for the density determinations of sugar solutions."

"In trade analyses the use of temperature correction tables should be dispensed with, as far as possible."

The following resolutions were also adopted:

"The normal temperature of + 20° C. is to be retained for trade analyses.

"In density determinations of aqueous sugar solutions, the density obtained at normal temperature shall be referred to the density of water at + 4°C and to vacuo."

"In density determinations made by weighing, the results must be calculated to $\frac{20}{4}$°C. and to vacuo. To effect this it will be desirable to use tables prepared for this purpose."

M. Saillard, the French delegate, agreed to the latter part of the resolution, provided that in France the normal temperature there customary, namely $\frac{15}{4}$ °C., be retained in place of $\frac{20}{4}$°C.

"Wherever white light is used in polarimetric determinations, the same must be filtered through a solution of potassium dichromate of such a concentration that the percentage content of the solution multiplied by the length of the column of the solution in centimetres is equal to nine."

"Inasmuch as recent investigations tend to question the validity of the present 100° point of saccharimeters, and inasmuch as it is desirable that the Commission recognize and fix a transformation factor from absolute degrees to Ventzke degrees, the President is hereby empowered to appoint a committee of three to fully investigate this question and report at the next official meeting."

307 - Bacteria in Grape and Fruit Wines and the Alterations due to them.

WINE-MAKING

MÜLLER-THURGAU and OSTERWALDEN. A Die Bakterien im Wein und Obstwein und die dadurch verursachten Veranderungen — *Centralblatt fur Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 36 No. 6-14, pp. 129-338 Jena, December 28, 1912.

The writers give in Chapter I of their very exhaustive work a short description of the bacteria occurring in wine; after which follows a description of the diseases and alterations of wine which are caused by bacteria.

In Chapter II the methods followed by the writers in cultivating pure strains of bacteria are described. As solid culture medium gelatine or agar-agar was used and as culture liquids several kinds of pear juices as well as grape juice. During the last ten years mostly extract of yeast (100 grams of pressed yeast to 1 litre of water) with the addition of about one per thousand of malic or tartaric acid and 2 to 3 per cent. of cane sugar, levulose or dextrose were added.

Chapter III contains an accurate description (Morphology, Physiology, Classification) of the pure cultures of bacteria grown by the writers. These all of them belong to the lactic acid bacteria; they are divided into four kinds: *a*) *Bacterium mannitopeum* (several strains); *b*) *Bacterium gracile* (several strains); *c*) *Micrococcus acidovorax*; *d*) *Micrococcus variococcus*.

Bacterium mannitopeum Müller-Thurgau, is found in great numbers in fruit and grape wines containing lactic acid. It forms short rods and shorter or longer septate and non-septate threads. The short rods are rounded at the extremities, 1.5 µ in length and varying in diameter between 0.7 and 1.3 µ, rarely outside these limits. The single rods do not show any spontaneous movements and do not form spores. In juices and wines the bacteria often form large tufts composed of long very much tangled threads. In wines of a certain composition zoogloeæ are often formed; they are spherical bodies in whch the single bacteria are often no longer easily to be distinguished, being firmly attached to each other by means of an intervening substance. These zoogloeæ may become bladder-like aggregates of bacteria. These bacteria do not liquefy gelatine. Colonies deep in the gelatine are of round, spherical shape, smooth; superficial colonies are roundish, with very ragged margins. Gram positive. Facultatively anærobic. They cause energetic fermentation of levulose, dextrose and galactose, with production of much lactic, acetic and carbonic acids, as well as mannite from the first-named substance and ethyl alcohol from the other two. They further cause fermentation of saccharose, maltose, raffinose, *l*-arabinose, xylose, *a*-methylglucoside and amygdalin, but not of lactose, rhamnose, phloridzin, mannite, dextrin and peptone. They destroy malic acid, but slowly, citric acid in small quantities; fairly energetically acid ammonium malate, tartaric acid and its salts, succinic acid and lactic acid. Optimum temperature: between 26 and 34° C. They form strains which differ from each other in the diameters of the bacteria and in the energy ot the lactic and mannitic fermentation.

Bacterium gracile Müller-Thurgau is found in grape and fruit wines containing lactic acid, as well as in those which have suffered a destruction of their acid content. These bacteria form short rods, and longer or shorter, often strongly bent, septate threads. The rods are 0.75 to 1 µ in length and their fairly constant diameter is 0.5 µ. No spores and no spontaneous motion. They seldom form tufts and then only small ones, that is small tangles of threads; they also form zoogloeæ and bladder-like aggregates. They do not liquefy gelatine. Colonies deep in the gelatine are spherical and smooth. Superficial colonies have entire margins. Gram positive. Facultatively anærobic. They cause fermentation of levulose, dextrose and galactose, with production of much lactic, acetic and carbonic acids, forming mannite from levulose and ethyl alcohol from the other two bodies. They do not induce fermentation in saccharose, lactose, maltose, raffinose, *l*-arabinose, xylose, rhamnose, phloridzin, mannite, dextrin or Witte's peptone, but do so in *a*-methylglucoside and to a certain extent in amygdalin. They decompose energetically malic and citric acids and calcium malate; with less energy neutral potassium malate and ammonium malate. Tartaric acid and its salts are not attacked, nor are succinic and lactic acids. Optimum temperatures between 22 and 26° C. They form strains which differ less in the dimensions of the rods than in the energy of the fermentation they set up.

Micrococcus acidovorax n. sp. is fund in wines in which destruction of acids is taking place, also mixed with other causes of infection in diseased wines. It forms single cocci, diplococci and tetrads (merismopedian aggregates). Single cocci 0.5 to 0.7 μ diameter. They form zoogloeæ and bladder-like groups in wines of certain compositions. The cocci show no spontaneous movement and form no spores. They do not liquefy gelatine. Colonies deep in gelatine are of spherical shape and smooth. Superficial colonies are rounded and their edges entire. Gram positive. Facultatively anaerobic. They produce only lactic acid and decompose dextrose, levulose, galactose, lactose and maltose, producing much lactic acid without by-products such as acetic and carbonic acids. They do not cause fermentation of saccharose, raffinose, *l*-arabinose, xylose, rhamnose, *a*-methylglucoside, amygdalin, phloridzin, mannite, dextrose or Witte's peptone. They decompose malic acid energetically, forming lactic and carbonic acids, and also decompose neutral calcium malate and neutral ammonium malate. They do not cause the fermentation of tartaric acid and its salts nor of citric, succinic, and lactic acids. Optimum temperature: 26.5° C.

Micrococcus variococcus n. sp. is found, for instance, in red and white wines in which destruction of the acid content is going on ("siedende Weine"). They form cocci, diplococci and tetrads (merismopedian aggregates). The diameter of the single cocci varies considerably, from 0.6 to 1.5 μ. In wines of certain composition they form zoogloeæ. The cocci have no spontaneous movement and do not form spores. They do not liquefy gelatine. Deep colonies in gelatine are spherical and smooth; superficial colonies have entire margins. Gram positive. Facultatively anærobic. They produce only lactic acid, but with less energy than *Micrococcus acidovorax*; they decompose levulose, dextrose and galactose, with formation of lactic acid and without by-products such as acetic and carbonic acids. They do not cause fermentation of saccharose, lactose, maltose, raffinose, *l*-arabinose, xylose, rhamnose, phloridzin, mannite, dextrin or Witte's peptone, but do so in the case of *a*-methylukosid and abundantly in the case of amygdalin, producing with the latter oil of bitter almonds. They cause active fermentation of malic acid, neutral potassium and ammonium malates and acid calcium malate, but not of tartaric acid and its salts, nor of citric, succinic and lactic acids. Optimum temperature: 26.5° C. They form strains which differ in the energy of their fermentative properties.

Considering the unsettled state which still prevails in the systematic classification of bacteria, it is difficult to class correctly the above-described species.

In Chapter IV the alterations in wine are discussed in the light of the results obtained with cultures of bacteria.

a) The simple destruction of acidity by the agency of bacteria, without the production of volatile acids or other unfavourable by-products is not to be considered as a disease of wines, since it increases the value of wines very rich in acids. It is just on this kind of destruction of acidity that very few data are found in the works of French investigators; they speak of "*tourne*" and "*pousse*" and mean by these terms a morbid alteration of wines. While according to the writers "pousse" implies several alterations of wine caused by bacteria and accompanied by the formation of carbonic acid. This "pousse" can appear together with the simple destruction of acidity, with the formation of lactic acid and with "tourne." Under "tourne" the writers understand only the *consequences of the destruction of acidity in wines that are poor in acids.*

The destruction of acidity is not caused by ferments but by bacteria, namely *Bacterium gracile* or species of *Micrococcus* (*Micrococcus malolacticus* Seifert, M. *acidovorax* and *M. variococcus*). Cool cellarage, early racking from the lees, the addition of potassium metasulphite to the wine or the fumes of burning sulphur delay the destruction of acidity, which can also be prevented by the addition of acids. Malic acid as an addition is too expensive; besides, some bacteria destroy this acid also, as well as citric acid. As the most suitable the writers recommend tartaric acid. Tannin also reduces the destruction of acidity. Fining cannot be considered as an efficient remedy, as it does not rid the wine of the bacteria which cause the mischief.

Where a diminution of acidity is desirable, it can be favoured by the omission of some of the above-mentioned preventive processes. Whether the reduction of acidity may be promoted by the addition of cultures of bacteria must be ascertained by further experiments.

b) Acidity due to lactic acid occurs in fruit wines that are deficient in acidity and in mild grape wines; it is detected by a sour sweetish, somewhat acid taste and an odour recalling sauerkraut. The principal symptom of sourness due to lactic acid is the decomposition of sugar, accompanied by the production of lactic acid and much volatile acid. With this, as a rule, the destruction of malic acid and frequently a mannitic fermentation are connected, though the quantity of mannite that is formed depends essentially upon the temperature and upon the extent to which alcoholic fermentation had proceeded when the disease made its appearance. In French literature no special term is found for the sourness due to lactic acid, it being considered by French investigators together with mannitic fermentation and "tourne." The writers consider the sourness due to lactic acid and mannitic fermentation as two distinct diseases, with the reserve that with the latter the former is always connected, while lactic acid sourness can appear alone. In the writers' experiments, *Bacterium mannitopeum* was almost always the cause of lactic acid sourness; only exceptionally could it be attributed to *Bacterium gracile.* A high content of acidity or of tannin or a moderate amount of both together can prevent lactic acid sourness. Very low temperature during fermentation can also act as a preventive, though with low acid and tannin content even a slight degree of warmth is sufficient to originate lactic acid sourness. Early racking from the lees is a preventive of the disease when it is connected with an average acid and tannin content and moderate temperature. It behaves similarly with the use of sulphurous acid. The employment of pure ferments is also a protection to a certain extent against lactic acid sourness.

c) The " mousiness " (smell and taste of acetamide) according to experiments by the writers, appears to be due to *Bacterium mannitopeum*. These bacteria multiply chiefly in liquids containing sugar ; consequently this taste appears in refermented wines to which sugar solutions have been added.

d) The turning ("tourne") of wines has already been mentioned above. The writers abstain from giving a definition of this disease, as their investigations on it are not yet sufficiently advanced. They do not affirm that turning is *always* a consequence of the destruction of acidity, but they conclude from the results of their investigations on diseased wines that the two phenomena are intimately connected.

In Chapter V the writers give advice on the analyses of wines, and recommend not only the determination of the amount of lactic acid but also investigation of its origin by means of bacteriological examination. It is true that all the bacteria that the writers describe are producers of lactic acid, but their power of producing this acid is various.

Wines containing only small quantities of lactic acid and of volatile acids are generally sound.

In wines containing much lactic acid and little volatile acids a destruction of acidity has, as a rule, taken place. Examination under the microscope can reveal what kind of bacteria have taken part in the process ; most frequently *Bacterium gracile* will be found to have been the cause, though cocci can also be found. Wines contain but little lactic acid and much volatile acidity when, owing to improper handling, they have contracted acetic sourness. As mould ferments also produce volatile acids they also can be taken into consideration. In both cases investigation under the microscope throws light on the origin of the volatile acids. If more than 1 per thousand of lactic acid is found, it is to be assumed that this is due to acid-destroying bacteria or to the transformation of sugar caused by bacteria.

Much lactic acid and much volatile acid (2 to 3 per thousand) appear with lactic acid sourness. As causes, *Bacterium mannitopeum*, the mannite ferment of Gayon and Dubourg, and exceptionally also *Bacterium gracile* may be considered. The first two are easily revealed by the microscope. If *Bacterium gracile* is the cause, the presence of mannite in the wine can be shown by microscopical investigation. If *Bacterium gracile* has only destroyed acidity and formed lactic acid, while acetic acid bacteria have formed acetic acid, no mannite will be found.

When much lactic acid and much acetic acid are present and the latter prevails, most frequently it is a case of lactic acid sourness connected with acetic acid sourness.

308 - The Acidification of Musts by the Action of Yeast during Alcoholic Fermentation.

FERNBACH, A. L'acidification des moûts par la levure au cours de la fermentation alcoolique. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 997, pp. 113-111. Paris, January 23, 1913.

All liquids containing sugar, when submitted to alcoholic fermentation, undergo during the process an increase in acidity due, in a slight measure, to the production of succinic acid, but chiefly to the formation of volatile acids (acetic acid predominates always, and sometimes is the only volatile acid formed). Numerous different species of yeast are clearly distinguishable by the nature and the proportion of the volatile acids they produce in a given medium.

The experiments of which the results are given later, were undertaken for the purpose of ascertaining how the acidification of the fermenting liquid varies in the use of the same yeast, according to different influences, and particularly in order to discover if this variation is due to the influence of the reaction of the medium.

To this end, the writer sowed a number of cells of the same species of yeast in a series of flasks containing the same sugary liquid, either artificial or natural (grape must), adding increasing amounts of tartaric acid varying from 0 to 8 gr. per litre. In the different flasks of the same series, he determined at the same time whether the fermentation had been completed or not, the acidity of the liquid, the amount of sugar remaining, the alcohol produced and the weight of yeast formed. The following are the figures obtained in the course of some of the writer's experiments, giving the increase in acidity expressed everywhere, as is the original acidity, in mg. of total tartaric acid:

A. *Beer Yeast Br.*

Original acidity		0	25	50	100	200
Increase in acidity	Expt. *a*	59.5	45.4	41	33	6.5
	Expt. *b*	59.8		50	50	29.3

B. *Wine Yeast.*

Original acidity		0	25	50	100	200	400
Increase in acidity	Yeast C.	66.5	52	48	22.5	—	—
	Yeast L.	123.5	107	100	91	61.5	44

It is seen that, in all these cases, the less acid the liquid was at first, the greater the subsequent increase in acidity. Thus the various yeasts are affected in the acidification which they produce, by the influence of the medium in which they act, quite independently of their own individual characteristics.

This conclusion is of great importance from the practical standpoint. Acidification has of late been rightly regarded as a means of increasing the stability of fermented beverages, and it has been strongly recommended that those yeasts which give rise to the highest degree of acidity should be selected. It is evident that the influence exerted upon this acidification by the original acidity of the must should be taken into account.

The above mentioned facts show that this matter is no less important theoretically, for the study of the mechanism of alcoholic fermentation. Indeed they furnish a practical means of increasing acid production by yeast, and the writer hopes to show shortly how this method can be employed in the study of the intermediate products of fermentation.

309 – Analytical Characters of the 1912 Musts in the Canton of Vaud, Switzerland.

PORCHET, F. and TONDUZ, P. Moûts vaudois 1912. — *Procès-Verbaux de la Société Vaudoise des Sciences naturelles*, No. 2, 1913 (meeting of January 8). Lausanne, January 1913

This article gives a summary of the analytical statistics of the musts of Vaud in 1912 (1). The analyses dealt with 137 samples. The dry cold weather, which on October 16 encouraged optimism, was unfortunately of very short duration, for on the 21st rain fell once more. This new damp period produced a decrease in quantity and quality — a rare occurrence — causing the ripe grapes to rot, while the less ripe ones remained unharmed.

In spite of this, the predictions were realized in so far that the sugar content of the 1912 musts was, on the average, very similar to that of those of 1911. The following table shows the difference in this respect between the musts of 1912 and the wines of 1911.

District of Aigle-Yvorne-Villeneuve.

	29 samples of 1912 musts.		29 samples of 1911 wines.
	Sugar %	Corresponding alcohol %	Alcohol %
Maximum	23.3	13.2	12.1
Minimum	15.0	8.8	9.4
Average	19.1	11.1	10.6

District of la Côte

	43 samples of 1912 musts.		41 samples of 1911 wines.
Maximum	20.1	11.9	11.7
Minimum	12.7	7 5	9.6
Average	16.5	9.7	10.5

District of Lavaux.

	31 samples of 1912 musts.		25 samples of 1911 wines
Maximum	20.3	12.0	12.5
Minimum	13.8	8.1	9.8
Average	17.4	10.2	11.1

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(1) For the 1911 musts and wines of Vaud, see No 713, *B.* April 1912. (*Ed.*).

District of Morges.

	14 samples of 1912 musts		12 samples of 1911 wines
Maximum	16 9	10 5	11 9
Minimum	13 6	8 0	8 8
Average	15.3	9 0	9 9

District of Vevey-Montreux

	15 samples of 1912 musts.		31 samples of 1911 wines
Maximum	19 6	11 5	11 9
Minimum	15 4	9.0	9 2
Average	17 5	10 3	10 0

As is shown by these figures, the average alcohol content of the 1912 wines in two of the districts is superior to that of the wines of 1911, while in the three other districts it is inferior; the differences vary between +0.5 per cent. and —0.9 per cent.

Acid content. — The season of 1911 produced wines in the Canton of Vaud which were abnormally deficient in acids, while those of 1912 had a very high acid content. The figures have not yet been generally recorded, but the statement refers not only to the Swiss vineyards, but also to those of the rest of Europe, with the exception of the southern parts of Italy and of Spain.

The acidity of the musts from Vaud which were analysed varied from 9.8 gr. to 16.4 gr. per litre; in the greater number of the samples, it was between 11 and 13 gr. per litre. It is an interesting scientific fact, which has been recorded fairly regularly, that when the fruit ripens with difficulty, the acidity is due essentially to malic acid and not to tartaric acid or acid salts.

Usually the malic acid in wines is split up by the action of a micrococcus into lactic acid and carbonic acid. This causes a decrease in the acidity independently of the settling of the tartrates. At the end of January 1913, this malo-lactic decrease was not yet perceptible in the 1912 Champ-de-l'Air wine, though it contains 6.3 gr. of malic acid out of a total acid content of 13.6 gr. per litre.

OTHER INDUSTRIES DEPENDING ON PLANT PRODUCTS

310 - New Materials for Paper-Making.

1. — New Sources of Paper (*Hedychium coronarium* Koen and Allies) — *Royal Botanic Gardens, Kew Bulletin of Miscellaneous Information*, No 9, pp. 373-378 1912

2 — Marram Grass for Paper-making. — *Ibid*, p 396

3 — Experiments with New Materials for the Manufacture of Paper. — *Bulletin of the Imperial Institute*, Vol X, No 3, pp 372-380 London, 1912

1. — *Hedychium coronarium* (Zingiberaceæ) is a native of India, being distributed from the Himalayas to Ceylon and Malacca; it is also recorded from Central America, the West Indies, Mauritius and West Africa (Corisco Bay). In some of the States of Brazil it has run wild, being especially abundant at Morrettes in the State of Parana, where it has covered a large tract of swampy country. In Brazil, the plant grows

thickly and completely covers the land. The stems are said to reach a height of 1 to 1½ metres (3 to 5 ft.) and to be about 2-4 cm. in thickness; on the margins of streams, however, the stems grow as high as 2 metres (6ft. 6 in.). After cutting down the stems, some 4 to 5 months must elapse before they grow again.

Paper has been made both from the dried material received from Brazil, and from fresh stems supplied from Kew. The paper in both cases was found to be identical, and the plant seems likely to be a valuable source of material for the paper-maker. The fibre has great tensile strength, the "breaking length" being from 9 000 to 10 000 metres. The elasticity and folding qualities of the paper are exceptional. It can be made to bear ink and possesses parchment qualities without any special treatment. These properties are due to the presence of cells of a semi-gelatinous nature, which are associated with the fibre; the amount of these cells in the unbleached paper is 17.3 per cent. Cellulose in stems when air-dried 41 per cent.; length of fibre in unbleached *Hedychium* 2.61 mm.

The writer gives a description of paper-making and of the physicochemical properties of the fibre. He concludes by saying that owing to the remarkable qualities of *Hedychium* it seems likely to be in considerable demand in the near future.

The stems of *Amomum hemisphericum* and *Alpinia nutans* (Zingiberaceæ) were also examined as to their paper-making qualities. The former is a native of Java; the latter is recorded from Hong Kong, Formosa, Cochin China, the Eastern Himalaya and the Malay Peninsula; it is also known from the West Indies, Guatemala, Venezuela, Surinam and Brazil. The stems of *Amomum* reach a height of 5 metres (over 16 ft.); those of *Alpinia* are stated to be 2.5 to 3 m. (8 to 10 ft.) high. The latter plant would probably form dense thickets in swampy country.

Yield of unbleached paper: from green stem, *Ammomum* 7.44 per cent., *Alpinia* 5.93 per cent., and from the dry stem respectively 58.2 and 50 per cent. Both plants are suitable for making white and brown paper, but they are considerably inferior to *Hedychium*, being devoid of the self-sizing property of the latter.

2. — Marram grass (*Ammophila arenaria* Link.). This plant grows on the sandhills on the coast of Great Britain and acts as a very valuable sand-binder. Experiments in paper-making have been made with marram grass, which possesses quite useful qualities in this direction. The yield of unbleached paper from the green stem was 17.7 per cent. and that from the dry stem 31.4 per cent. The average length of unbeaten fibres contained in the pulp was 0.65 mm.

3. — The following table gives a summary of the results of the examination of new materials for the manufacture of paper undertaken at the Imperial Institute (London).

Material examined	Moisture on drying at 100-110°C.	Ash in dried material	Yield of pulp (dried at 100-110°C).			Loss in weight in pulp on bleaching	Length of ultimate fibres
			Non bleached		Bleached		
			Percentage of dried material	Percentage of material as received			
	%	%	%	%	%	%	mm.
Papyrus (stems) from E. Africa	13.6	8.6	31.4	26.3	30.7(1)	2.3	1.32
Papyrus (stems) from the Sudan	13.8	6.9	34.2	29.4	33.1(1)	2.9	1,32
Arundo Donax from the Transvaal	13.4	2.7	27.6	23 9	—	4.8	0.15
Aristida sp. Transvaal. . . .	9.0	2 7	28.2	25.6	25.1(2)	2.3	0.86
" Nipa " (petiole and fibre) from the Malay States . .	21.5	14.2	13.8	10,8	12.6(1)	8.4	1.42
Borassus flabellifer (leaves) from Mozambique	10.3	4.1	48 (3)	43 (3)	—	—	3
Bromelia (leaves) from Brazil.	14 3	7.2	21 (about)	18 (about)	—	—	0.89
Algerian Esparto.	8.8	3.0	32.3	29.5	32 (1)	1.3	1.14

(1) Percentage of dried material. — (2) Percentage of material as received. — (3) Cellulose.

All the fibrous materials enumerated are capable of conversion into pulp suitable for the manufacture of paper, though in some cases it is not known whether they could be utilised to advantage on a commercial scale. The raw materials would probably not realize more than about £ 3 per ton in the United Kingdom, and it is therefore very unlikely that they could be profitably exported, especially in view of their bulky nature. For this reason, in conjunction with the fact that they furnish somewhat small yields of pulp, the best way to deal with these fibrous products would be either to convert the raw material into " half stuff " and export the latter, or to employ it locally for the manufacture of paper.

PLANT DISEASES

GENERAL INFORMATION.

311 - Report for Presentation to the Ghent Congress of 1913, Respecting the Plant Pathology Service, by the International Union of Professional Horticulturists.

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

SMET, A. DE (Président de la Chambre syndicale des Horticulteurs Belges, Gand). Rapport sur le service phytopathologique de l'U. H. P. I. — *Union Horticole Professionnelle Internationale, U. H. P. I., Rapports pour le Congrès de Gand en* 1913, *présentés par le Président, H. Muller, Langsur*, pp. 17-19 (n. d.).

By means of circulars and its annual report for 1911, the "Chambre Syndicale des Horticulteurs Belges" has published in detail the proceedings of the Horticultural Congress at Luxemburg. The above-mentioned Chamber has drawn the special attention of the Belgian Government to the changes in the transport service suggested by the Berne International Congress and to the institution of a Service of Plant Pathology. The information thus furnished has been given due consideration by the Belgian Government; the law for the establishment of a Service of Plant Pathology has been passed (1) and, on the occasion of the next Railway Convention, the Government will as far as possible try to meet the wishes of the horticulturists.

Propaganda work in the same direction is in progress in France under the auspices of the "Fédération des Syndicats Horticoles de France." The writer insists upon the necessity of similar work being done in every country; for only in this manner will the International Union of Professional Horticulturists be able to carry on efficiently its international work.

The "Chambre Syndicale des Horticulteurs Belges" has interested itself much in the creation of a Plant Sanitary Service, and has always endeavoured to keep the plants and horticultural products of Belgium free from cryptogamic diseases and from injurious insects; providing its members with instructions and means of combating these pests. By profiting from the attempts made in other countries, the Chamber has elaborated a scheme, which seems to embrace the prophylactic measures necessary for all lands. The Luxemburg Congress unanimously adopted the inspection project put forward by the Belgian Syndical Chamber, and

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1) See No. 66, *B.* Jan. 1913. *(Ed.)*.

passed a vote expressing their wish that the Service of Plant Pathology should become general throughout Europe. The same Congress voted that all crops should be placed under the care of inspectors whose duty should also include imparting practical instruction to growers regarding methods of controlling plant diseases. Such a service, but placed upon a broader basis, has been established by the law brought forward on March 26, 1912, and approved by royal decree.

Phytopathological regulations were sanctioned in Holland by the law of March 29, 1909. A Service of Inspection of Horticultural Products was established in France by the decree of May 1, 1911. Plant pathological inspection in Great Britain is governed by a series of regulations (1). The United States have special laws for every State of the Union (2).

The writer suggests that each of the syndicate Associations of the International Union of Professional Horticulturists should be requested to furnish an account of the Service of Plant Pathology in its particular country (3). Once the text of the different laws was obtained, it would be possible to coordinate them, arrange them under a general head, and prefer to the different Governments an official request for the establishment of a Plant Sanitary Service, which should be alike in all the affiliated countries, and make obligatory that all horticultural products when exported should be furnished with a certificate of immunity. This certificate should be drawn up according to one model, as in the case of that adopted by the International Phylloxera Convention of Berne (4).

312 - Decree concerning the Reorganisation of the Service of Phytopathological Inspection of Horticultural Produce in France. (5).

Décret portant reorganisation du Service d'inspection phytopathologique de la production horticole en France. — *Journal officiel de la République française*, Year 25, p. 857. Paris, January 26, 1913.

The President of the French Republic issued the following decree under date of January 16, 1913:

Article 1. — The work of the Service of Phytopathological Inspection of Horticultural Products instituted by the Ministry of Agriculture by the decree of May 1, 1911, has been modified and determined as follows:

Art. 2. — The Staff of the Service is nominated by order of the Ministry within the limits of the appropriation for this object in the Budget of the Ministry of Agriculture. It consists of: *a*) A chief inspector, the Head of the Service, to whom is entrusted the direction and scientific control of each of the branches of the Service, the superintendence of the work of the inspectors and assistant inspectors, the furnishing of necessay instructions to these officers to enable them to carry out all the investigations required by the present decree, and the supplying, when required, of the certificates of phytopathological inspection. *b*) An assistant to the chief inspector, whose duty it is to assist the principal inspector in his work. *c*) Temporary agents, with the title of inspector, entrusted with visiting the horticultural institutions committed to their care to see that the plantations are in good condition, that produce despatched thence harbours no insects known to be injurious, and no cryptogamic diseases capable of spreading, and if necessary, to provide certificates of phytopathological inspection. *d*) Temporary agents, bearing the title of sub-inspectors and capable of supplementing the inspectors of the Service in the branch which is especially entrusted to them.

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(1) See No. 1676, *B.* Dec. 1912.

(2) See No 182, *B.* Feb. 1913. (*Ed.*).

(3) See in this connection: *L'organisation actuelle du service de protection contre les maladies des plantes et les insectes nuisibles dans les divers pays.* — Rome, International Institute of Agriculture, 1911. (*Ed.*).

(4) See: CUBONI, G. The Basis of an International Agreement for the Control of Plant Diseases. *B.* Nov. 1912, pp. 2349-2354. (*Ed.*).

(5) See also No. 1604, *B.* May 1911; No. 3084, *B.* Aug.-Sept.-Oct. 1911. (*Ed.*).

Art. 3. — The officers of the Phytopathological Service are required to ensure, within the limits of the present decree and the Ministerial instructions, the supervision of those horticultural establishments and branch institutions entrusted to them. When on inspection tours, the inspectors must be provided with the card proving their identity; this they receive from the Minister of Agriculture.

Art. 4. — The inspectors and sub-inspectors are proposed by the chief inspectors and nominated annually. Their number varies according to the requirements of the Service. The conditions for recruiting inspectors and sub-inspectors are settled by ministerial decree.

Art. 5. — The work of the chief unspector and his assistant is settled by Directors of State Scientific Institutions nominated by the Minister of Agriculture, who will also apportion to each individual his special task.

Art 6. — The chief inspectors, inspectors and sub-inspectors nominated under the present decree receive in remuneration of their services and for their travelling expenses a sum which is not subject to the deductions prescribed by the law of June 9, 1853, in the case of civil pensions and is calculated according to a basis fixed by the decree of the Minister of Agriculture.

Art. 7. — The expenses entailed in the phytopathological inspection of horticultural products are stated in a special clause in the budget of the Ministry of Agriculture. They are apportioned among the persons interested in the following manner: the first charge of the expenses is covered by a fixed annual tax of £1, levied upon each controlled horticultural establishment, and the surplus is divided in proportion to the market value of the products for which phytopathological certificates have been granted. The portion to be contributed by each horticulturist is recovered by means of taxes levied and collected by the Minister of Agriculture, even in the case of total or partial refusal of certificates of phytopathological inspection. These sums are entered under the head of " Various contributions to the budget ".

Art. 8. — Every horticulturist who wishes to submit his premises to phytopathological inspection must apply to the Minister of Agriculture before April 1 of each year, writing his request upon stamped paper according to the prescribed form and pledging himself: *a*) To conform absolutely to the instructions of the Minister of Agriculture, or his representative, in all matters concerning phytopathological inspection. *b*) To state in a declaration accompanying his request the precise situation of the plantations to be inspected and the approximate area of each. *c*) Not to include among plants which he sends away, any from unsupervised plantations, without furnishing to the inspector in his district entrusted with supplying phytopathological certificates the name and address of the nurserymen furnishing the said plants; the establishments of these nurserymen must be entered on the lists of phytopathological inspection. *d*) To send with each request for a certificate of pathological inspection a certified copy of the consular envoice accompanying the goods which tallies with his bookkeeping entires and gives the detailed and total value of the plants sent. *e*) To provide the officiers of the service charged with visiting his establishments with all necessary assistance in the discharge of their duties. *f*) To pay at the prescribed intervals the amount which falls to his share of the expenses incurred in the organization of the Service of Phytopathological Inspection, in accordance with the provisions of article 9 of the law of Dec. 16, 1910 and of article 2 of the present decree.

Art. 9. — The State assumes no responsibility for itself and its agents as regards the possible results, either to the horticulturists or to any third party, of the organization or working of the Service of Phytopathological Inspection provided by the present decree, or as to the acceptance or refusal by foreigners of the certificates of phytopathological inspection.

Art. 10. — As soon as the officials and agents of the Service are aware that the horticulturists have not fulfilled all their engagements, they must at once inform the Minister of Agriculture, who will decide upon the necessary measures to be taken.

Art. 11. — The Ministers of Agriculture and of Finance are entrusted, in their several capacities, with the execution of the present decree.

313 - Royal Decree concerning the Introduction into Libya of Woody, Agricultural, Forest and Ornamental Plants coming from the Kingdom of Italy.

Regio decreto riguardante l'introduzione in Libia delle piante legnose, agrarie, forestali, ornamentali provenienti dal Regno d'Italia. — *Gazetta ufficiale del Regno d'Italia*, Year 1913, No. 32, p 805. Roma, February 8, 1913.

His Majesty the King of Italy, considering the Law of July 6, 1912, No. 749; considering the Royal Decree of November 20, 1912, No. 1205; on the proposal of the Minister of the Colonies in accord with the Minister of Agriculture, Industry and Commerce, has, on February 2, 1913, decreed as follows:

Art. 1. — The introduction into Libya of woody, agricultural, forest and ornamental plants coming from the Kingdom of Italy is forbidden unless said plants be accompanied by a certificate of origin issued by the municipal authorities and by a certificate guaranteeing their immunity from such diseases as would endanger the produce of plants cultivated in the Colony.

Art. 2. — Such declaration will be issued by the Royal provincial antiphylloxera delegate or by the technical delegate of the antiphylloxera association, according to the single text of the Laws, June 6, 1901, No. 356, and July 7, 1909, No. 490, on the Associations for the defence against phylloxera, or by the Directors of Stations or of Laboratories of Plant Pathology or of Agricultural Entomology. Horticultural establishments, schools and gardens which are inscribed in the official list which is published every year by the Ministry of Agriculture are exempted from the obligation of presenting the certificates mentioned in the preceding article.

Art. 3. — As for vines, the introduction of rooted cuttings or rooted plants is absolutely forbidden. Only the importation of cuttings is allowed provided they be accompanied by the certificate mentioned in Art. 1.

Art. 4. — Plants coming from abroad are subject to the provisions set forth in the Antiphylloxera Convention signed at Berne on November 3, 1881, besides which their immunity from diseases other than phylloxera is to be recognized by an expert before their introduction is allowed.

Art. 5. — Plants found infected by the diseases mentioned in Art. 1 shall be destroyed and the owner shall have no right to any indemnity. The Minister proposing this Law is charged with the execution of the present Decree.

314 - New Zealand Prohibition against Crown-gall

The Agricultural Gazette of New South Wales, Vol. XXIII, Part 12, p. 1042. Sydney, December 1912.

The New Zealand Government has issued a proclamation prohibiting the introduction into the Dominion of any fruit or plants infected with the disease known as Root knot, Hairy root, or Crown-gall (*Bacterium tumefaciens*). If any plant, fruit, etc., affected is introduced or attempted to be introduced, it and any wrappings, etc., will be re-shipped or destroyed at port of entry. Re-shipment, however, is conditional on the approval of the inspector, and, in the event of destruction, the fees for such destruction are payable by the person in charge of the consignment.

315 - Rhodesian Restriction on Potatoes.

The Union of South Africa Government Gazette, Vol. X, No. 290, p. 783. Pretoria, November 5, 1912

The Southern Rhodesia Government Notice No. 319 of 1912, dated 3rd October, reads as follows :

Any consignment of potatoes imported from other parts of South Africa or from oversea, if found on inspection to be infested with the pest known as " root gall worm " (*Heterodera radicicola*), will be refused admittance to Southern Rhodesia or destroyed.

BACTERIAL AND FUNGOID DISEASES.

FUNGI

316 - Effect of the Time of Sowing upon the Susceptibility of Wheat to Bunt *(Tilletia Tritici).* (1).

MUNERATI, O. Sulla recettività del frumento per la carie in rapporto al tempo di semina. — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXI, Part 12, pp. 875-878. Rome, 1912.

From experiments made by the writer in 1909 and 1910, it appeared that the temperature at the moment of sowing and during the days of the first phases of the development of the young plant, has a decided influence upon the susceptibility of the wheat itself to the attacks of *Tilletia Tritici* (Bjerk.) Wint. In order to test this statement further, the writer repeated the experiments in 1910-1911 and in 1911-1912. In the first season a winter wheat (Cologna) and a spring wheat (Marzuolo Veronese) were used, and in 1911-1912 Gentil Rosso and Marzuolo Americano Rosso.

The results of the investigations and observations of these four years show that:

a) A seed which is severely infected with the resting spores of *Tilletia* does not necessarily give rise to a plant which will be attacked by the disease. The factor which in this case determines the susceptibility to the parasite, is the temperature at the time of sowing and during the days of the early phases of development; the more rapidly the wheat grows the better it escapes from the attack of the parasite, and viceversa. The same seed can produce 0 per cent. of infected ears in the first case, as against 80 per cent. in the second.

b) No treatment of the seed will thus ensure immunity from the attacks of bunt. But in practice, it is wise to apply some treatment to the seeds in order to destroy any bunt spores which may chance to adhere to the integument of the wheat; this is the more urgent, when it is desirable, or necessary, to sow late in the autumn or very early in the spring.

c) The application of an adhesive substance (such as is effected by immersing the seeds in a solution of copper sulphate and spraying them repeatedly with lime) does not ensure complete immunity from *Tilletia* in the case of every plant, as it may be attacked either by spores which afterwards adhere to the integument, or by those with which the germinating seed comes into contact in the soil; nevertheless a considerable number of spores are rendered innocuous by the prolonged fungicidal action of the copper compound.

The decided influence of the sowing time upon the susceptibility of wheat to bunt would explain why in past years, when the seed corn received no treatment, seasons when the parasite was rife alternated with those when the crops were almost free from its attacks. The years when the parasite caused great havoc were those when the plants grew slowly during their first phases of development.

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(1) See also No. 1679, *B.* Dec. 1912. *(Ed.)*.

The observations made also suggest that when it is wished to determine the efficacy of a fungicide or special method of *Tilletia* control, it is well to sow the treated seed either late in the autumn (in the case of winter varieties) or very early in the spring (for spring kinds), in order that the plants may be as susceptible as possible to the attacks of the parasite.

MEANS OF PREVENTION AND CONTROL

317 - Lime-Sulphur Washes in the Control of Fumagine and Olive Scale (1).

CALABRESI, G. A. La poltiglia solfo-calcica nella lotta contro la fumaggine e la cocciniglia dell'olivo — *Il Coltivatore*, Year 59, No. 1, pp. 19-20. Casale Monferrato, January, 10, 1913.

In 1912, control experiments of fumagine and the olive scale were made at Vasto (Abruzzi) with lime-sulphur washes (formula of the Royal Experimental Station for the Cultivation of Citrus and Fruit Trees at Acireale, (2), Sicily).

Four applications were made: the first was carried out in three distinct zones of the oliveyards, which served as an experimental plot and 8, 6 and 4 per cent. solutions were respectively used; in the subsequent spraying, solutions weaker than two per cent. were sprayed on all the trees. These treatments were repeated on each reappearance of the scales.

The scales have almost entirely disappeared from the experimental olive-yard; the fumagine attack was so far advanced that there was no hope of curing the disease, although the wash had the effect of slightly checking its development.

A 4 per cent. solution of this wash was also applied to some trees which had been grafted three years previously and planted in the spring; no scorching or other bad effect was noticeable, even on the young buds, which were very plentiful.

These experiments will be repeated, on a larger scale, during 1913.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

318 - The Diseases of the White Lupin in the State of Sao Paulo (Brazil).

BONDAR, GREGORIO. Tremoço branco e suas molestias. — *Secretaria da Agricultura, Commercio e Obras Publicas do Estado de Sao Paulo, Boletin de Agricultura*, Series 13, No. 5, pp. 427-432, 2 figs. São Paulo, 1912.

Amongst the plants cultivated in the State of São Paulo, Brazil, the white lupin (*Lupinus albus*, "Tremoco branco") occupies an important position, especially as a green manure for coffee, vines, etc.; further it is a plant which grows very well and does not fear drought.

On the estate of the Agricultural Institute of Campinas, this plant is attacked at all its stages of development by a disease called by the writer anthracnose, and due, according to him, to a new species of *Gloeosporium*

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(1) See also No. 973, *B.* June 1912; and No. 1245, *B.* Aug. 1912. (*Ed.*).

(2) See No. 753, *B.* April 1912. (*Ed.*).

(*G. Lupinus* sp. nov.); the hybrid of the same white lupin grown at the Campinas Institute proved resistant to the disease.

The first sign of infection is the appearance of blackish patches at the base of the leaves; these spread all round the petioles and cause the withering of the leaves attacked. The disease shows its presence first on the stalks by a black discoloration of parts of the cortical tissues, followed by formation of concave black patches. When these extend much over the stem, the plant dies and the roots rot.

According to the statement of the writer, the parasite may cause the destruction of 90 per cent. ot the plants.

As the use of remedies is impossible, the following preventive measures may be recommended: *a*) the cultivation of resistant varieties; *b*) the rejection of seeds from infected plants; *c*) leaving unsown soil which has been infected by the fungus during preceding seasons; *d*) the scrupulous observation of good cultural methods.

The writer has further observed that the white lupin and its hybrid are often attacked by *Heterodera radicicola*. This nematode does not cause the death of the hybrid; it was found that the dead plants of white lupin were always infected also by *Gloeosporium*. It therefore seems probable that *Heterodera* merely weakens the plants upon which it lives and predisposes them to fall victims to fungus parasites.

For the control of the nematode the writer advises, amongst other means, a change in rotation and the practising of good agricultural methods.

INSECT PESTS.

GENERALITIES

319 - The Nutrition Conditions of Certain Larvae of Diptera, which are Parasitic on Fruit.

KEILIN, D. Structure du pharynx en fonction du régime chez les larves de Diptères cyclorhaphes. — *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 155, No. 26, pp. 1548-1550, figs. Paris, December 23, 1912.

ID. Sur les conditions de nutrition de certaines larves de Diptères parasites de fruits. — *Comptes rendus hebdomadaires des Séances de la Société de Biologie*, Vol. LXXIV, No. 1, pp. 24-26 Paris, January 10, 1913.

In his first article the writer showed by reference to numerous examples that the larvæ of certain *Diptera*, whether parasites of plants or animals, or predatory and carnivorous in their habits, in short such larvæ as generally live upon live tissues, never possess chitinous ribs or longitudinal folds in their pharynx. These special structures on the other hand are always present in the pharynx of saprophagous larvæ, which feed upon decomposing animal or vegetable matter. In the same family larvæ can be found with and without these ribs according to their manner of living.

Amongst the *Trypetidae*, the writer has studied the larvæ of *Trypeta* sp. and of *Urophora* sp., both parasites on the capitula of *Centaurea;* their pharynx, like that of all other parasitic larvæ, is without ribs on the ventral wall, which is completely smooth. All the *Trypetidae* of which the larvæ are known have been observed to be parasites of different plants, attacking the stem, flowers or fruits.

Amongst the larvæ found on fruits (which the writer especially deals with in his second article) several are known to do much injury to crops; their life-histories and the methods of their control have been the subject of much research.

M Keilin has recently been able to examine two of these larvæ *Anastrepha ludens* Lœw, from the ripe fruits of *Psidium* from Costa Rica, and *Dacus oleae* Meig, which, as is well known, damages olives. Contrary to his previous observations, the writer found that these two larvæ possess well-developed ribs like those of the saprophagous larvæ. Thus, in the family of the *Trypetidae* there are larvæ (*Trypeta* and *Urophora*) which have no ribs, and others (*Anastrapha ludens* and *Dacus oleae*) which have a pharynx furnished with these longitudinal folds.

In order to explain this fact, it is necessary to suppose that the conditions of life in the fruits are from some points of view analogous to those of a saprophagous existence, in which case it is requisite to determine the particular conditions which bring about this convergence.

Two contingencies are possible: *a*) The diastases of the fruits may exercise an important function in the preparation of the nutritive medium of the larva; these diastases, having been derived from the cells which were punctured by the ovipositor of the female at the moment of egg-laying, may begin to digest the vegetable tissues situated near the egg, which in the case of the olive is surrounded by a brownish zone. The larva, once hatched, destroys the cells in excavating a gallery and thus would continue to provoke the emission of diastases. *b*) Or, on the other hand, the diastases may not be derived from the fruit cells, but may be produced by the micro-organisms introduced by the ovipositor of the female fly and carried on progressively by the larva while making tunnels in the fruit, when the grub would be truly saprophagous. These two possibilities are not contradictory, for it is very likely that the nutritive medium of the larva is prepared both by means of the fruit diastases and by those produced by the micro-organisms which were introduced with the egg.

It seemed to the writer that observations and experiments made *in situ* were necessary to decide this question, interesting alike from the biological and practical standpoints. It would be necessary to study carefully the manner of feeding of these larvæ, in order to ascertain, for instance, whether the larvæ of *Anastrepha ludens* and of *Dacus oleae* can derive nourishment from the fruits without the intervention of a micro-organism: if this is impossible, it should be discovered whether this micro-organism, which is indispensable to the existence of the larva, is not always present on or near the fruit. In the latter case, the destruction of the micro organism would be another means of controlling the destructive insects.

MEANS OF PREVENTION AND CONTROL

320 - The Control of Grasshoppers in South Africa (1).

CARLE, G. La lutte contre les sauterelles dans les pays de l'Afrique du Sud. — *Colonie de Madagascar et Dépendances, Bulletin économique*, Year 12, 2nd. Half-year of 1912, No. 2, pp. 163-166. Tananarive, 1912.

In 1908, a special commission was appointed with the approval of Lord Selborne, the then Commissioner for South Africa, to decide as to the measures to be taken to prevent an invasion of locusts. The Commission, persuaded of the necessity of instituting a widespread preventive enquiry in all the colonies and territories under its supervision, especially as regarded the appearance and effective methods for the control of these pests, established the "Locust Bureau" for the study of the conditions of development of this insect.

The British Colonies, the Territories of South Africa and the Governments of German South-West Africa and of Portuguese East Africa shared in the support of this bureau. The British possessions included the Cape of Good Hope, Natal, the Transvaal, the Orange River Colony (now forming together the Union of South Africa), Southern Rhodesia, and the Protectorates of Bechuanaland, Basutoland and Swaziland. Experience had shown that the appearance of locusts within the territory included in the above-mentioned provinces depended on flights occurring in the bordering countries not within the sphere of British influence; thus the Commission was obliged to obtain at least annual reports on the conditions of existence of the locusts in the respective territories of the Governments of German East Africa, Nyasaland, N. E. Rhodesia and N. W. Rhodesia.

All the administrations took part in the work of the Bureau and all information relating to the flights of the locusts was sent to the Secretary of the Bureau at Pretoria.

The information thus obtained from various sources, was entered by means of conventional signs on a plan. At the end of every month, the Secretary sends to each administration a small plan of South Africa beginning at lat. 10° South, showing at a glance the condition of the development of the locusts in the entire district. All the officials of the colonies interested have already received postcards with a form on the back, whereon may be inscribed the characteristics of the flight (importance, direction, condition, etc.).

The commission meets annually in May to read and study the reports from the different districts. The total of these reports for 1909 forms the fourth annual report of the Bureau. Two reports from Portuguese East Africa are published by the portion of that province which is under the control of the Mozambique Company. It is to be noted that two vast territories, one belonging to the Nyassa Company and the other to the Mozambique Company, though united to Mozambique, yet are practically independent of the Government.

The reports described two species of injurious migratory locusts in South Africa, one with red wings (*Cyrtocantharis septemfasciata*) and the other brown (*Pachytylus sulcicollis*); but it is probable that other locusts have done damage in South Africa.

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(1) See also No. 1521, *B.* May 1911. *(Ed.)*.

A flight of *Locusta danina* was observed in 1907; some members of the Locust Bureau consider this species should be referred to the true brown locust; further some non-migratory locusts have been confused with migratory ones, even by experts on the subject. The public is invited to submit to the Bureau specimens of any flight of which the members do not seem to resemble either the brown locust or the true type with red wings already known.

The eggs of the brown locust preserve their vitality for some years (three and a half years being apparently the limit) when there is too little damp to allow of their hatching. Slowly, but surely, the eggs in the end dry up and perish.

The flights of locusts have not always attained the same importance in South Africa. The red-winged locusts appeared in Natal about 1893, where they had not been observed for fifty years; locusts only began doing much damage about 1890, but from that date the agriculturists have suffered loss every other year from the injury caused by these insects, while in the neighbourhood of Johannisburg it was even suggested to give up all cultivation of the ground, if the locusts had continued to make their appearance.

From the fourth report of the Bureau, it appears that in 1910 the locusts had already effected some damage in the German Colony of the Southwest. In 1909, vast flights leaving the Kalahari desert spread over Cape Colony and the Orange River Colony and attained the coast between Port Elizabeth and East London. The locusts laid their eggs, but strong measures were taken as soon as these began to hatch out; and the remaining insects fell a prey to birds.

At the present time, the Commission considers that those districts of Africa which are under its control are practically secure from serious invasion. But it is imperatively necessary to exercise the most diligent supervision in order to be able to control the pest should it reappear.

As the result of experiments, the Locust Bureau expresses its preference in the control of these insects for arsenical mixtures applied to the locusts at the moment of their emergence from the egg; but when they are already on the move an aqueous solution of arsenate of copper is more efficacious. To this should be added a greater or less quantity of molasses and of sugar. Apparatus have been supplied to all the branch offices of the administration; the insecticide ready prepared is put on the market and is supplied free or at reduced prices, thanks to Government subsidies. The control operations were directed by special "locust officers", assisted for the time by soldiers.

The insecticide destroys at once the insects which it touches, but those which are not directly affected perish, being poisoned either by the grass sprayed with solution or by the dead poisoned locusts.

The insecticide now used in Africa is prepared under the care of the Government in suitable iron receptacles containing 1 ½ gallons, and bearing a special mark and the inscription locust poison. Every vessel contains 5 lbs. of arsenate of soda with 69 per cent. of arsenic, 1 gallon of molasses and 10 lbs. of brown sugar. To prepare this poison, 200 lbs. of arsenate of soda are dissolved in 15 gallons of boiling water and sufficient cold water is added to bring the amount up to 20 gallons. Into each receptacle is poured half a gallon of this solution, to which is added later one gallon of molasses, and the whole is carefully mixed. This constitutes the "Prepared Locust Poison".

In the circular of September 1, 1909, the Agricultural Department of the Transvaal advises the following mixture:

a) for locusts at least a fortnight old:

"Prepared Locust Poison"	1 part
Water	66 parts

b) for older locusts:

"Prepared Locust Poison"	1 part
Water	50 parts

Two labourers can prepare 200 receptacles per day.

	s	*d*
Each receptacle costs	1	0
The price of the contents is as follows:		
Molasses		7
Arsenate of soda	1	0
Mixing		1
Sundry expenses		2
Total	2*s* 10*d*	

The solution should be sprinkled as sparingly as possible on the vegetation surrounding a swarm of sleeping locusts, or on a strip of ground some yards wide before a swarm on the wing; this prevents the grass or the insects from being soaked with the solution. The locusts are attracted by the sugary liquid and are usually all killed in the space of a few hours.

The experiments of the "Locust Bureau" have shown that, in the absence of all elementary precautions, the cattle of the regions where this treatment is applied are not harmed. It is well to take some measures to guard against skin irritation during the use of the insecticide. The best remedy is to distribute the liquid in hermetically sealed vessels, all ready to be put into the water, and to use a sprayer similar to that used for spraying vines.

321 - Campaign against *Agrotis ypsilon* in India (1).

Communication from Mr. W. B. Heycock, *Director of Agriculture, Behar and Orissa, to the International Institute of Agriculture.*

The campaign against *Agrotis ypsilon*, which was carried on by the Entomological Section of the Agricultural College at Sabour during the last four months of 1912, proved a complete success. About 120 000 moths were caught during September, October and November. About 10 000 acres of land, which used to yield practically nothing on account of this caterpillar pest, will this year give an outturn worth 4 to 5 lakhs of rupees. The methods of procedure were: 1) attracting and killing the moths by means of 2 doz. Andres Maire traps and 2) picking off the first broods of caterpillars from the first attacked areas.

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(1) See No. 83, *B.* Jan. 1913; No. 193, *B.* Feb. 1913. (*Ed.*).

322 - Results of Experiments in the Control of Olive Fly made in France from 1907 to 1912 (1).

CHAPELLE. La lutte contre la mouche de l'olive. — Resultats des experiences du Service de l'Oleiculture (Annee 1912) — *Bulletin mensuel de l'Office de Renseignements agricoles*, Year 11, No. 12, pp 1703-1707. Paris, December 1912.

The writer, who is the Inspector-Director of the Service of Olive-growing in France, has made many experiments at different places in the South of France during the last six years upon the control of the olive fly (*Dacus oleae*).

These experiments have led to the following conclusions:

1. Sprayings with arsenical molasses made from June to October reduce the damage caused by the insect; and if applied over large areas, or in isolated plantations, the crop is completely protected. In the latter case, the number of sprayings may be reduced.

2. Dry treatment by means of different kinds of poisoned bait spread throughout the oliveyards had no appreciable effect.

3. Mixed treatments were successful, but the experiment of 1910 tends to show that in these the spraying is the only active agent.

The use of strong doses of sugary washes does not promote, as might be feared, the propagation of fumagine, for the small quantities of molasses sprayed on the trees are removed by the first showers of rain.

Clearly the practical method of combating the olive-fly is spraying with a wash prepared according to the following formula:

Molasses containing 2.5 per cent. of arsenate of soda .	15 lbs.
Water to make up.	10 gallons.

This mixture should be applied to the trees in very small quantities (one gallon to 12 or 15 trees at each spraying) and by means of ordinary sprayers furnished with straight jets.

When the oliveyard, from its extent or isolation, offers unusually favourable conditions for treatment, safety can be obtained with two sprayings, the first applied at the beginning of July and the second at the time when the infested trees chiefly harbour pupae (usually early in September).

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(1) See also No. 1051, *B.* March 1911; No. 2369, *B.* July 1911; No. 3065, *B.* Aug-Sept.-Oct. 1911; No. 721, *B.* April 1912. (*Ed.*).

In districts where the crop is late (Maritime Alps, Corsica), it is necessary to watch the evolution of the parasite and, if necessary, to spray a third time in the autumn.

The writer, in conclusion, draws attention to the fact, that under less favourable circumstances than those which attended his experiments (great extent of the oliveyard, its isolation, extreme susceptibility of the olive trees to the parasite), if the protection afforded is not complete, still the amount of disease is noticeably reduced and the returns thus obtained from the crop more than compensate for the expenses incurred.

323 – Experiments in the Control of the Olive Fly by Means of Traps at Poggio Mirteto (Umbria) in 1912.

GORNI, O. and PASSALACQUA, P. Esperienze di lotta contro la mosca delle ulive, eseguite a Poggio Mirteto col sistema delle capannette del prof. Lotrionte e dirette dalla Cattedra ambulante di Agricoltura per la Sabina nel 1912. — *L'Italia Agricola*, Year L, No. 1, pp. 19-20 Piacenza, January 15, 1913.

This experiment was carried out in an oliveyard in the hills of elongated shape and containing about 1100 trees of the Carboncella variety, most of which were mature, while all were in good condition. As the oliveyard was not isolated, an attempt was made to protect at least the central portion, by making an artificial barrier against the olive fly; to do this, every tree in the two or three outermost rows was provided with two olive-fly traps ("capanette dachicide") (1). On each of the other trees only one trap was affixed; the total number used was 1200. From July 3 to October 10, 1912, the traps were sprayed 6 times.

On a first visit to the oliveyard, made on September 10, the writers found considerable infection in the case of about fifty trees of the zone on the south of the oliveyard; but the others were practically free. This fact is to be attributed to the presence of numerous buildings on the southern part of the oliveyard and especially of brick kilns, which were at work throughout the year, and afforded a comfortable and safe shelter to pupæ and adult hybernating flies during the winter. Infection to the extent of 25 per cent. occurred throughout the neighbouring control plantations.

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(1) The "capannetta dachicida", recently devised by Prof. Lotrionte, Director of the Chair of Agriculture of Tivoli (Rome Province), is a small shelter made of tin, or better galvanized iron, 10 by 14 in., bent into one or two ridges, and containing a small bundle of dry twigs, rather loosely tied together, and projecting somewhat from the sides of the shelter. Two pieces of twine, or preferably wire, serve to keep the shelter in shape, secure its contents and suspend it from one of the horizontal branches of the tree. To attract the insects, the bundle of dry twigs is sprayed four or five times during the season with a poisonous mixture; Prof. Lotrionte's formula is 50 to 60 lbs. liquid glucose, 2 lbs. arsenite of soda, 2 lbs. boric acid, 2 lbs. borate of soda and water to make up to 10 gallons. It is calculated that 44 gallons of this mixture suffice for 1000 traps. The mixture is sprayed onto the twigs with a knapsack sprayer with extension rod; a man can spray 600 to 700 in the day. Each trap costs 2*d* ready on the tree, and may last four to six years, especially if made of galvanised iron. The cost of four treatments is about 1 ½*d* per tree. The experiments made with this system in 1911-1912 in the provinces of Rome, Perugia, Pisa, and Lecce gave excellent results. Cf. CENCELLI, A. Difesa contro la mosca olearia. — *Il Coltivatore*, Year 58, No. 36, pp. 593-597, fig. 168. Casale Monferrato, December 30, 1912. (*Ed.*).

From the final results ascertained on the occasion of a visit paid on November 10, it appeared that in the outermost zone on the north, east and west sides, that is to say in the case of the trees in immediate contact with the control oliveyards in which no sort of treatment had been carried out, the average infection was 50 per cent. But on proceeding towards the centre and south side, the disease decreased sensibly, until in the central zone the infection was only 20 per cent.

The observation made in the southern part, where the trees were vigorous and laden with fruit, is interesting. The infection, which showed itself here first and to a somewhat noticeable extent, was afterwards evidently arrested in such a manner that at the time of the last visit, the olive fruits seemed almost all to be free from the fly (5 per cent. infected); the writers believe that, though the infection had set in here early owing to the presence of the brick kilns, the traps were able to keep it in check; and as this part was furthest from neighbouring plantations, it was less liable to subsequent re-infection.

In the control oliveyards close by, the infection varied from 95 to 100 per cent.; and in the rest of the territory of Poggio Mirteto it was about 90 per cent.

Given the conditions of the experiment, the writers consider the results obtained to be satisfactory and that the traps would yield better results with a more extensive zone of protection.

324 - A Practical and Efficacious Remedy against the Woolly Aphis *(Schizoneura lanigera)*.

CADOREL, ARTHUR. Le Puceron lanigère: un remède pratique et efficace. — *Le Progrès agricole et viticole (Édition de l'Est-Centre)*, Year 34, No 2, pp. 52-53. Montpellier, January 12, 1913.

The writer recommends as a remedy against the woolly aphis (*Schizoneura lanigera*), which is certainly one of the most difficult insects to destroy, the use of commercial oil paint, as being a simple, practical and economical substance ensuring the destruction of the colonies of aphides.

The paint can be prepared on the farm according to the following formula:

linseed oil	7	lbs.
white lead	1 ½	lb.
oxide of zinc	1	lb.

The mixture is boiled for 10 minutes, and when cold 1 lb. of turpentine is added. The paint is applied by means of a brush to all the infected parts. As a rule, one application is sufficient; but in order to be quite safe, two can be made, in the autumn and at the end of June.

By the use of this remedy the writer was able to save some old apple trees, which had been very severely attacked by *Schizoneura lanigera*.

INSECTS INJURIOUS TO VARIOUS CROPS

325 – *Bixadus sierricola*, an Enemy of *Coffea Arabica* in the Belgian Congo.

MAYNÉ, R. Un ennemi sérieux du *Coffea Arabica* au Congo Belge (*Bixadus sierricola* Wh.). — *Bulletin Agricole du Congo Belge*, Vol. III, No. 4, pp. 911-917, figs. 587-591 Brussels, December 1912.

Bixadus sierricola is a beetle already known as a coffee pest in West Africa. The insect reproduces itself annually. The adults appear in the morning from early October to the beginning of January, on the trunks of the coffee trees upon which they completed their development, or on the neighbouring shrubs. The eggs are laid towards the end of September and probably until the close of December at 6 to 12 inches above the ground, exceptionally on three-year-old plants, often on those which are 4 or 5 years old, but especially on old trees, whether they are weak or vigorous. The writer was not able to observe with precision the length of the egg period nor the exact time at which the young larvae appear, but he has reported the occurrence of some fairly well developed larvae on a certain number of trees as early as the second half of March. Anyway, the larval stage, during which *Bixadus* does a great deal of injury, can be divided into three very distinct periods. In the first the young larvae, as soon as they are hatched, destroy the cortex and the cambium zone by excavating galleries. In the second, they penetrate into the roots, where they also make wide tunnels; and later, returning to the exterior of the roots, they devour all the cortex and part of the wood of the latter, which become almost completely detached from the tree owing to the successive attacks of fungi, termites, the larvae of Elaterids and species of Scarabeids; the tree thus loses its stability, bends towards the ground and becomes gradually weaker, while the insect pursues its work of destruction. The trees, however, react by making wound tissues from which numerous adventitions roots develop, only to be destroyed in their turn by successive generations of *Bixadus* assisted by the previously mentioned pests.

The coffee trees in consequence become chlorotic, their fruit does not ripen and after some years of repeated attacks they die from exhaustion. At the close of the third period, the larvae ascend once more to the base of the stem and remain in the ligneous and cambium zones, but especially in the former.

At the end of August and the beginning of September, the larvae begin to pupate; the pupal period varies from 30 to 45 days (40 to 45 days in the case of males).

Means of control: the best is the capture of the insects at the commencement of the rainy season (October). The direct destruction of the larvae is difficult and little practised, but it is well to hunt for the grubs during the first period of their existence. The writer has made experiments against larvae in the third period of their development by injecting carbon disulphide, but with little success as the pests are protected in their galleries by plugs made of scraps of wood.

To meet with success in the attempt, it is better to defer it to the time of the metamorphosis (September), when a hole can be drilled to meet the galleries and a plug introduced, which is impregnated with carbon disulphide, or a mixture of ordinary petroleum and carbon disulphide; the aperture should be stopped up afterwards with clay, smeared over in its turn with coal-tar. Four fifths of the plants thus treated were freed from the parasites.

Amongst the various preventive methods, the writer mentions two which seem to yield good results.

Since the adult beetles leave the host plant by a hole near the ground, it is important that the whole of the trunk of the tree should remain exposed in order to ensure the escape of the insects. Immediately this has taken place, the trunk should be scraped to a height of about 16 inches, and this portion must be covered with coal-tar. The operation should be performed towards the second half of September, the old holes from which the insects have escaped being stopped up with clay as a preventive measure. It is also necessary to bank up the earth round the trunk of the plants attacked in order to give them a firmer hold of the ground.

The second method consists in substituting the following mixture for coal-tar in order to prevent the deposition of the eggs of *Bixadus*. Four gallons of soft soap are dissolved in the same amount of hot water: to this is added half a gallon of carbolic acid. The mixture is left standing for 24 hours, when it is diluted with from 32 to 40 gallons of rain water till it attains complete homogeneity.

If, however, a plantation has been infested for some years, it is best to burn the plants which are attacked at the time when the larvae inhabit the galleries, and to give up coffee cultivation for a few years.

326 – The Tobacco Thrips and its Ravages in Hungary.

TÓROK ELEMER. (Attached to the Experiment Station for the Cultivation of Tobacco at Debreczen.). A *Thrips tabaci* kártétele Magyarországon. — *Magyar Dohánynjsag*, Year XXX, No. 1, pp. 6-9. Budapest, January 5, 1913.

The tobacco thrips, observed for the first time in Hungary in the year 1890 in the model nurseries of the Government at Arad by M. Coloman Kerpely, Director of the Agricultural Academy and the Experiment Station for Tobacco Cultivation, has spread with increasing rapidity from that date. In 1908, the writer recorded the presence of *Thrips tabaci* in 7 districts of the country, two of which, Arad and Temes, had suffered considerably. In 1909, the invasion was of less severity, a fact due to the season being unfavourable to the propagation of the parasite; but now the latter threatens to extend even to the eastern portion of Hungary. Nevertheless, *Thrips tabaci* is little known to tobacco-growers, who attribute its ravages to a disease due to the weather.

It is known that this parasite only attacks the leaves of the tobacco, of which it destroys the chlorophyll. White patches occur where the leaf has been punctured and, as the insect is too small to be easily seen, the Hungarian tobacco growers often complain that their plants become lighter in colour every year. The leaves which are attacked lose 30 to 40 per cent., both in quantity and quality. The writer saw some leaves of garden tobacco of the Réthaz variety, which had deteriorated 80 per cent. But the varieties grown do not suffer to the same extent from this pest; there are some which the tobacco thrips attacks by preference, such as cigarette tobacco, while the tobaccos of Szeged, Szamoshat and the region of the Tisza are almost free from its ravages.

This very injurious insect has also made its appearance in other States. In 1878 *Thrips tabaci* was observed for the first time in Bessarabia, where the havoc it wrought was so great that the Russian Government deputed M. Lindemann, Director of the Agricultural Academy at Moscow, to visit the infected zone and try to discover a suitable method of control. This scientist obtained excellent results with an insecticide powder and by spraying with petroleum emulsion.

In Rumania, which is a very important centre of tobacco cultivation and where the crops had been much injured, various methods of control were used with success.

The writer, while admitting the efficacy of these methods, says that, taking into account the difficulty of their application in Hungary, the only remedy which can now be applied in that country is as follows: If *Thrips tabaci* has already made its appearance upon the young greenhouse plants, the lower leaves of the stems must be removed and burnt, as it is well known that at this time the insect is to be found chiefly upon these parts of the plant.

But if the tobacco is attacked after it has been planted out, it is necessary at once after the harvest to plough the infected plots very deep, as by this means the cut stems will be buried so deep that the eggs or larvae upon them will, in any case, perish.

327 - The Phoenix Skipper (*Pamphila dysmephila* Trim.).

KELLY, ALBERT, in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 6, pp. 876-882, 1 fig., plates I-V. Pretoria, December 1912.

For some years, *Phoenix reclinata*, Jacq., which promised to become a prominent garden plant in Natal, has been much injured by the attacks of *Pamphila dysmephila* Trim., an African butterfly belonging to the group popularly known as skippers. The insect, which was first observed on some specimens of Phoenix palms in the Government Gardens in Maritzburg, causes in its larval condition a peculiar and extensive defoliation of the plants attacked. Almost at once on emerging from the egg, the caterpillar joins the outside edges of the leaf with silken threads, thus forming a tunnel where it can lie concealed. Then it begins to devour the tip of the leaf, the tube being extended gradually backward as the leaf is demolished, thus affording a fresh place of concealment. Two or three larvae are sufficient to destroy a whole leaf.

Hand-picking and destroying the larvae are the best methods of control. The eggs are more visible than the larvae, and if these are destroyed, much injury can be prevented. It is, however, very necessary to institute a keen and regular inspection, as much damage may be done before the existence of the larvae is observed.

Spraying with arsenate of lead at the rate of 3lbs. to 50 gallons of water may be substituted for hand-picking, but better still, may be regarded as a desirable supplementary treatment.

328 - *Vesperus xatharti*, a Serious Enemy to the Vine in Catalonia (Spain).

Un insecto que causa graves daños a los viñedos. — *Revista del Instituto Agricola Catalán de San Isidro y Organo de la Federación Agricola Catalana-Balear*, Year LXII Part 2, pp. 23-26. Barcelona, January 20, 1913.

For the last two years, a disease has been observed in some of the vineyards of Penadés, which has destroyed a large number of vines. The symptoms resemble those of the so-called "apoplexy" (in Catalan dialect "feridura"), so that the injury has generally been attributed to this disease.

Of late, however, as the larvae of *Vesperus xatharti* (commonly known as "Menge-Mallols") have been discovered in the disturbed soil of a vineyard in the district, which has suffered severely, it is thought that the damage which has been noticed in the Penadés should be attributed to this longicorn beetle.

INJURIOUS VERTEBRATES.

329 - The Control of Field Voles in Italy. (1)

INJURIOUS VERTEBRATES

GHETTI, G. Contro i topi campagnoli. — *L'Italia Agricola*, Year XLIX, No 24, pp. 581-584, 1 fig. Piacenza, December 30, 1912.

Since 1911, the different products of the soil, and especially crops of lucerne, have been considerably damaged by field voles throughout the greater part of North and Central Italy. In the Province of Modena and also in the other provinces on the borders of Emilia, a bait (crushed maize) poisoned with phosphate of zinc has been adopted as a simple, practical, and relatively cheap means of controlling these pests.

In order to be efficacious, this method must be applied to all ground under lucerne, to pastures, both permanent and temporary, to drainage ditches, as well as to all cart tracks which traverse cultivated land. The bait should be spread during September and October, as at that time the voles are most numerous and feed chiefly on meadow grass. It is also an opportune moment, as it immediately precedes wheat-sowing.

When thoroughly carried out, this method gives excellent results; a few hours after the poisoned maize is laid down, the destruction of the voles commences, and it continues for four or five days; the number of these rodents which survive the treatment is very small.

Nevertheless, just in those zones of the province of Modena where this remedy had been most carefully used in September 1912, considerable damage to the wheat-fields was noticeable towards the end of the year. The observations made by the writer showed that the greater part of the destruction was due to the last generation of field voles ; during September and October these were being suckled by their mothers and were mostly on ploughed land, which, from mistaken motives of economy, had not been treated by the farmers.

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(1) See also No, 1488: *B*. Oct. 1912 and No. 1567, *B*. Nov. 1912. *(Ed.)*

Given the rapidity of reproduction of the field vole and its large broods, together with the ease with which it spreads from the centres of infection to the neighbouring district, the writer considers that for the control of this animal to be efficient, it will be necessary for a special law to be passed obliging the infested provinces to adopt a uniform method of control at the same date.

RUGGERI ALFREDO, *gerente-responsabile*.

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of February and March 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Progress of Mendelian Studies in Great Britain

by

R. C. Punnett,

Arthur Balfour Professor of Genetics in the University of Cambridge

The dramatic discovery of Mendel's work on plant hybridisation in 1900 inaugurated a new era for the breeder of plants and animals, and the opportunities for advance in the knowledge of heredity were in no country more rapidly seized than in Great Britain. The seed here fell upon prepared soil, for the problems to which Mendel found a key had already begun to engage the attention of Mr. Bateson and of Miss Saunders in Cambridge. The account of the experiments which they had started in 1897 and published as the well known 1st Report of the Evolution Committee to the Royal Society in 1902 was the most important contribution to the subject since Mendel's own paper, and was the first to open men's eyes to the vast possibilities latent in Mendel's work. A group of workers rapidly gathered round Bateson in Cambridge, and the contributions to be found under the names of Doncaster, Gregory, Lock, Staples-Browne, Miss Durham, Miss Wheldale and others bore witness to the activity of the rising school of genetics in the University.

All this work, like Mendel's own, was designed and carried out purely with the desire to gain definite knowledge of the workings of heredity, and little or no attention was paid to the economic results which might flow from the application of this knowledge to the affairs of those who bred animals and plants for profit. The material for study was selected on the ground of its cheapness, of the ease with which it could be worked, and of its suitability for giving a speedy answer to the problems put to it. Sweet-peas, mice, stocks, moths, snapdragons and poultry — such was the material investigated, and except for the last named it could hardly be said to possess much economic importance.

But it so happened that the stimulus to genetic work coincided with the rapid rise of the School of Agriculture in the University, and the enormous practical importance of the new knowledge was immediately appreciated by Professor Biffen, who was then starting his now famous experiments in the crossing of cereals. By making use of the methods of Mendelian analysis he was able to show that such qualities as strength, yield, and immunity to rust were transmitted in accordance with Mendel's law of segregation and consequently are under the control of the investigator, who can now devise suitable experiments for combining them together at will. Improved wheats of this kind have already come into use in England, and judging by the competition there is to secure the seed, they have already proved themselves a great success. The analysis of the wheat plant is still being actively carried on in Cambridge by Professor Biffen and his co-workers, and there is no doubt that as time goes on even better and more profitable varieties will be at the service of the British farmer. It is pleasant to be able to record that the importance of the work has been recognised by the Government, who have placed a considerable annual sum at the disposal of the School of Agriculture for research in plant-breeding. This has rendered possible an increase in the scope of the work, and experiments are now being carried out on other plants besides cereals. Among investigations now under way are some concerned with the transmission of fertility in fruit trees, while the striking success of Biffen's work on the nature of immunity to rust in wheats has led to the search for naturally immune individuals in other forms of plant life. Experiments with potatoes have been in progress for several years and thanks to the energy of Dr. Salaman, working on his own estate near Cambridge, and of Mr. Lesley of the School of Agriculture, the formation of a decent potato, naturally immune to ***Phytophthora infestans***, seems within measurable distance of realisation

Nor are the researches at Cambridge confined to plants. Poultry was one of the first subjects of experiment by Bateson and during the past ten years much has been learned of the transmission of various characters. Offering as they do a number of features showing sex-linked inheritance (1), poultry are of importance for gaining an insight into the nature of sex, and of studying the peculiar influence of each sex in the transmission of hereditary properties. Several of these sex-limited characters are now under investigation at Cambridge, while parallel experiments are being carried on by Professor Bateson at Merton.

Two other series of experiments likely to lead to knowledge of economic value are also being carried on at Cambridge. The first of these is concerned with the inheritance of size, and consists in carefully following out the result of a cross between an ordinary fowl and a bantam. The work is not yet sufficiently advanced to permit of complete analysis, but the nature of the F2 generation raised last year strongly suggests that size depends upon definite factors which exhibit ordinary Mendelian segregation. The other set of experiments mentioned concerns the inheritance of the brooding instinct in the hen and of the brown colour of the egg-shell. In England brown eggs are of greater value than white, but hitherto no breed laying brown eggs and in which the hens never want to sit has yet been established. It may be that brown eggs are incompatible with the non-broody habit, just as it is sometimes stated that a breed of cattle cannot be at the same time first rate in both milk-production and beef. It is hoped that the experiments in progress will eventually give definite evidence upon this point.

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(1) See No. 1319, *B.* Sept. 1912. *(Ed.)*.

Experiments have also been undertaken with sheep where the results of a cross between Merino rams (from Australia) and Shropshire ewes are being carefully followed. The experiments have just reached the F2 generation, and it is hoped that the knowledge gained from them will eventually render it possible to combine the fleece of the merino with the good mutton qualities of other breeds.

Besides the work just mentioned, there are other sets of experiments being carried out at Cambridge and Merton which may be regarded as forming a group by themselves. Bateson in 1905 was the first to describe in sweet-peas a remarkable case in which two characters each exhibiting ordinary Mendelian segregation nevertheless showed a peculiar distribution with regard to one another. In this particular instance the characters dealt with were colour, blue being dominant to red, and pollen-shape, long being dominant to round. Blue long X red round gave blue long in F1, and in F2 the expected ratio 3 blue : 1 red and also 3 long: 1 round. But the proportion of rounds among the blues was only about 1 in 12, whereas among the reds the rounds were in excess of the longs to the extent of about 3 :1. Since that date many other cases of this peculiar association of characters have been discovered in other plants, as well as in sweet peas, and certain generalisations have emerged from the study of them. We now know that if *A* and *B* represent two factors respectively alternate to their absence (*a* and *b*), then if the original cross is of the nature *AB* X *ab* the characters *A* and *B* will be more or less completely associated in the F2 generation so that of the 4 possible classes *AB* : *Ab* : *aB* : *ab* the first and the last will be the most numerous. If, however, the original cross is of the form *Ab* X *aB*, then of the four classes in F2 the *AB* one will be about twice as numerous as either of the two classes *Ab* and *aB*, while the class *ab* will be very rare. Where *A* and *B* go into the cross in association they tend to remain associated in F2, whereas when they go into the cross dissociated they tend to remain dissociated in F2. This peculiar phenomenon is not as yet properly understood, and it is with a view to obtaining further knowledge that experiments are being carried on at Merton by Professor Bateson, and at Cambridge by Miss Saunders with stocks, by R. P. Gregory with primulas, and by the writer with sweetpeas.

Recent work, more especially that of Morgan in America, has shewn that similar phenomena occur in animals, and there is no doubt that a proper understanding of them will eventually turn out to be of much importance for the breeder of plants and animals. It is a matter of common observation that characters seem at times to be transmitted in bunches as it were from one parent or other to the offspring, and it is likely that in such cases we are dealing with phenomena of the kind just outlined.

The best equipped Institute in Great Britain for the study of genetics is undoubtedly the John Innes Horticultural Institution at Merton, near London. Started in 1909 with funds derived from private bequest it was fortunate in securing Professor Bateson, who left Cambridge in 1910, as its first Director. Fortunately also its scope is broad and the experimental work undertaken is concerned with the unravelling of the principles of inheritance in the widest sense, apart from considerations of direct economic return. Numbers of experiments are at present being carried out by Professor Bateson and his staff, principally with plants, not the least interesting being a series of experiments dealing with fertility and sterility in fruit trees.

Besides Cambridge and Merton there are several other places where genetic research is being carried on. Mr. Hurst, one of the pioneers in Mendelian studies, has established an experimental station at Burbage near Leicester, which aims at the production of economically valuable varieties of plants and animals by working upon Mendelian lines. Mr. Hurst is experimenting with many different plants and animals, and some of his most interesting experiments concern horses and aim at the production of a pure race of steeplechasers, *i. e.* of animals with a special aptitude for hunting.

Genetic research is also being carried on by Professor Keeble at University College Reading, the chief material investigated being primulas. But perhaps the most interesting work from this source is that dealing with the chemical side of genetic problems. It is well known that in primulas there are white flowers of two kinds, *viz.* those dominant and those recessive to coloured. Professor Keeble and Dr. Armstrong have recently amplified the work of Miss Wheldale and others, and have demonstrated that these two forms of white, though alike in appearance, can be distinguished by definite chemical tests. Such work opens up a new and important field of study, and it is possible that as this branch of knowledge develops the genetic analysis of plants and animals will be greatly simplified by the substitution of direct chemical tests for the elaborate series of breeding experiments which are at present necessary.

Among the experimental work in progress in England should be mentioned that of Mr. Staples-Browne, of Bampton near Oxford, who is continuing his researches with pigeons, more especially with reference to sex-limited characters; also the work of Trow of Cardiff, who has recently contributed a valuable paper on inheritance in *Senecio*. In this paper and in another shortly to appear Dr. Trow has made a definite advance in the understanding of those peculiar cases of association between characters to which reference has already been made.

In Ireland, Professor Wilson of Dublin has lately brought together a number of records dealing with the heredity of coat-colour in cattle and horses and with the milking capacity of cows.

Scotland has also made a start by creating a Lectureship of Genetics in the University of Edinburgh, to which Mr. Darbishire was recently appointed.

In conclusion, it should be mentioned that the study of genetics in Great Britain is not confined to those who work on these islands. Cambridge sends her students all over the world, and the value of genetic research to the breeder is evidenced by the work of Balls on cotton in Egypt, and by that of Leake and of Howard on cereals, cottons, and other plants in India.

The Cultivation of Potatoes under Irrigation in the Neighbourhood of Athens

by

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The climate of Attica, and indeed of the whole of Greece, is characterized by severe drought in summer. Numerous observations made by the National Observatory at Athens show that the mean rainfall at Athens during the spring months February to June is about 150 mm. (5.9 in.) (1); it scarcely ever snows, and as the rain is mostly torrential, most of the water flows rapidly to the sea.

On account of the drought, the potato crops and most of the other vegetables are cultivated on irrigated land, except in the most northern provinces of the Kingdom, as Corfu, Manissa (Thessaly), or in some of the valleys of the Peloponnesus (Arcovia, Laconica) (2) suited at high altudes, where, the summer rainfall exceeds that enjoyed by the plains.

At Athens, as in all large cities, an enormous quantity of potatoes is consumed, and as the supply produced in the vicinity is relatively small, potato-growing has for some years extended from the plains of Attica to the neighbouring plains capable of irrigation.

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(1) The following data are from the Athens Observatory:

Month.	Number of days with rain	Rainfall. mm.	Rainfall. in.	Atmospheric humidity
—	—	—	—	—
January	11	55.9	2.18	72.8
February	11	37.6	1.47	74.4
March	11	57.2	2.23	70.4
April	8	22.3	0.87	63.7
May	7	21.4	0.83	58.8
June	4	11.3	0.44	43.3

(*Author's note*).

(2) Annual rainfall at Athens 421.6 mm. 16.60 in.
» » » Corfu 1171.1 » 46.11 »
» » » Zante 979.5 » 38.56 »

(*Author's note*).

The annual production of the villages of Attica is about 5000 tons (1); but though it increases every year in a surprising manner, the supply is insufficient; consequently, large quantities of potatoes from the neighbourhood of Thebes or Corfu (2) are also consumed in Athens.

VARIETIES OF POTATOES GROWN IN GREECE.

Two varieties of potatoes are grown in Attica; these were long ago imported from Trieste and are known on the market under the names of the villages where they are most cultivated.

1) " Patissiotiki " or " Platicote " (Patissia or flat potato). Tubers somewhat small, about the size of a hen's egg, flattish, rounded; eyes superficial; skin regular, yellowish red; flesh yellowish, firm. Its starch content, according to the analyses of the Laboratory of Agricultural Chemistry of Athens, is 13.5 per cent (3). This variety is the most prized on the markets and its retail price is always 5 or 10 lepta (½*d.* to 1 *d.*) per oke (2 ¾ lbs.) more than that of other varieties. Its vegetative period lasts about 4 months.

2) " Kerkyraiki " or " Stronggili " (Corfu or round potato). Tubers medium or large, rounded oval, smooth-skinned, golden yellow; eyes sunk; flesh distinctly yellow, less firm than that of the preceding variety. Starch content 15 per cent. Its yield per acre is a third more than that of the Patissia variety. Its vegetative period is 4 months.

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(1) The production per village is:

	tons —
Patissia	1323
Klfissia	590
Chalandri	422
Amaroussi	837
Menidi	1770
Eleusis	59
Aspropyrgos	284

(*Author's note*).

(2) The production of the neighbourhood of Thebes for the year 1911-12 was about 6140 tons, of which the greater part was sold on the Athens market

(*Author's note*).

(3) The analyses were as follows:

Variety —	Weight of tuber — gr.	Water — %	Dry Matter — %	Starch — %
Patissioliki No. 1 . . .	139.0	79.4	20.6	14.8
» » 2 . . .	100.0	79.9	20.1	14.3
» » 3	72.5	82.7	17.3	11.5
Kerkyraiki » 1	133.5	77.8	22.2	16.4
» » 2	103.2	79.6	20.4	14.6
» » 3	98.5	80.2	19.8	14.0

(*Author's note*).

Some varieties of potatoes imported from Germany and grown at the Agricultural Station of Tyrintha produced small tubers which found no purchasers on the markets.

SEASON OF PLANTING.

In districts where the potato is irrigated, two crops are grown in the year, either in the same, or in different, fields. The date of the first planting is from the end of January to the end of February and the crop is lifted from the middle of June to the middle of July: this is the "winter crop." The second time of planting is from the end of July to the end of August and the crop is lifted from the end of October to the end of November: this is the "summer crop."

On account of the scarcity of potatoes on the markets. the crop is often dug before it is ripe, the loss entailed by diminution in weight being made up by the higher prices obtained at these seasons.

ROTATIONS.

Most cultivators, as a rule, grow two crops a year on the same land for several years, manuring the soil annually with the fertilizer mentioned later. When the soil shows signs of fatigue (generally after 3 or 4 years of consecutive cultivation) they replace the summer potato crop by barley, sown early for fodder, and the winter crop by maize for fodder, or some vegetable crop.

In some centres, where the value of land is relatively small, the potato grower prefers only raising one crop annually in the same field — the summer crop which fetches the highest price (July-November) — and subsequently sowing fodder barley.

SEED SELECTION AND PREPARATION.

The largest potatoes are selected for seed, or at any rate those as big as a hen's egg. These must be from the crop immediately preceding, *i. e.* those for winter cultivation should be from the preceding summer crop and those for summer cultivation should be the produce of the preceding winter.

Potatoes required for seed are left in the soil to ripen thoroughly. When pulled up, the selected tubers are wiped with a piece of linen to remove all the earth. Potatoes for summer cultivation, dug at the end of June, are left for 1 or 2 days on the field to dry a little; then they are placed in a shed or under a tree, where they remain 30 to 40 days; during this time they wrinkle owing to loss of moisture, which causes them to sprout readily on planting. This drying until they wrinkle is essential for both winter and summer cultivation, for otherwise most of the buds would not develop when the potato is put in the ground. During this time the heap is turned once or twice so as to air the potatoes; and 4 or 5 days before planting they are watered a little.

The seed potatoes for the winter crop (dug in November, planted in January) are kept in a very thin layer, in a light, dry, well ventilated place, where they very soon turn green.

Before planting, the tubers are cut into two or three, or even more pieces, but care is always taken that each piece shall contain at least three strong eyes. The seed-potatoes of the summer crop can be kept for some days after being thus divided provided they are covered with cloths or straw kept damp.

Some growers prefer Kerkyraiki for the winter crop and Patissiotiki for the summer crop. In this case they grow a small area of the other variety at each season to provide seed for the ensuing crop for sale. others, in order to obtain earlier growth in the following crop dig up the seed potatoes about 20 days before they are quite ripe.

Preparation of the Soil and Planting.

A. *Winter crop (February to July).* — Careful cultivators prepare their fields in winter by two cross ploughings, followed by picking to a depth of from 16 to 20 inches before planting. Others are statisfied with two or three deep ploughings. At the time of planting, the soil is carefully levelled and then divided by ridges into lands 3 ft. to 3 ft. 9 in. wide. In these lands, furrows are opened at 10 to 12 inches apart, and 4 to 6 inches deep according to the compactness of the soil. In order to economise the ground, the ridges separating the irrigation lands are also planted. Often indeed the planting is done first and the ridging afterwards.

The seed potatoes are then placed at the bottom of each furrow at 10 to 12 inches apart and at once covered with a large handful of well-rotted stable manure or with a mixture of this and grape pomace. The potatoes remain thus until March, when the soil is thrown over them with a hoe.

The manure destined for the potato field is prepared and placed in a heap a long time beforehand; it can be purchased at about 7*s.* 6*d.* per ton. In winter, when rendered very damp by the rain, it is turned once or twice, grape pomace often being added in the proportion of a quarter.

In Attica, dung is the only fertilizer used in growing potatoes; it is applied at 12 to 16 tons per acre. The use of chemical fertilizers has not spread, owing to the want of success obtained with them at first which was due to ignorance of the way to use them.

B. *Summer crop (August to November).* — Thanks to the preceding crop of potatoes, there is generally a good tilth on the land for the summer crop. Before planting, when possible, it is ploughed twice somewhat deeply. It is often necessary to water to facilitate this ploughing, which is carried out in the dry season. The soil is then levelled and divided into lands as for the winter crop; These are then thoroughly wetted and later picked to a depth of about 12 inches as soon as possible. The potatoes are planted like the winter crop, but closer together: 8 to 10 inches in both directions. The sets are covered and the furrows levelled.

For this crop, no manure is used, as the growers consider that at this season it raises the temperature of the soil, thus disturbing the normal development of the plant. Further, the manure left in the ground from the preceding crop is considered sufficient. Seed potatoes which have grown in the ridges are preferred.

The amount of seed per acre is 11½ cwt. in the case of the winter crop, and 14½ cwt. for the summer crop.

HOEING AND WATERING.

A. *Winter crop.* — As has been already remarked, the first hoeing is done towards the middle of March. Later, when the young shoots are 4 to 6 inches high, the soil is hoed once more (called "dry hoeing"). After ten days, if the ground is dry, it is watered for the first time and subsequently, as soon as it can be worked, is hoed and the rows are slightly earthed up. Afterwards, whether the weather is wet or not, the field is watered nearly every week, but without hoeing; all these irrigations are carried out by flooding each land, the water being conveyed by means of small channels.

B. *Summer crop.* — Some days after planting, a light hoeing is effected to break up the crust formed by the watering subsequent to planting. After 12 to 15 days the field is again watered, and hoed as soon as the condition of the soil permits; 8 to 10 days later, if it has not rained, the soil is watered and hoed once more; if it has rained, the watering is omitted. This process is repeated about every week, till there is fear of harming the young plants with the implements. Watering at longer or shorter intervals, according to whether there is rain or not, continues until the end of October.

LIFTING THE POTATOES.

The best time for this is when the leaves and haulms turn yellow, their change of colour being accompanied by the maturity of the potatoes. Generally the winter crop is gathered during the second half of June and the summer one at the end of November. The yield per acre of the former is 7 to 10 tons, and of the latter about 8 tons.

The average wholesale price of the winter potatoes, where they are grown, is near £5 per ton and that of the summer crop £8; they fetch 1¼*d.* to 2*d.* per pound when sold retail in Athens.

Progress and Results in Fruit-Growing in Germany

by

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All the progress in fruit-growing in Germany in the last decade and most of the work on the subject has been in the direction of the improvement and extension of commercial fruit-growing, so as to be able to supply the needs of the country with German fruit.

With the increased population and the greater prosperity of the country, more attention is paid to the hygienic principles which are the foundations of good health and longevity. Fruit and vegetables are necessary to health and are, at the same time, agreeable articles of diet.

I. — The most important work of the German pomologist and fruit-grower has been in the past, and still continues to be, the careful selection and widespread propagation of the best kinds of fruit among the originally overwhelming number of varieties grown in the country. This selection has been often repeated in the course of time in the various fruit-growing districts on account of the great differences in climate and soil.

The varieties of apples and pears given later are placed in the order in which they most usually occur in the 34 local lists (1) of fruit cultivated in Germany.

Apples: Boskoop Beauty, Golden-Pearmain, Landsberger Reinette, Baumann's Reinette, Charlamowski, Gravenstein, Boiken, Geflammter Kardinal, Prince, Dantziger Kant (Calville de Dantzig), Ribston Pippin, Roter Eiser, Grosse Casseler Reinette, Grosser Bohnapfel, Gelber Edelapfel, Cox's Orange Reinette, Weisser Klarapfel, Apfel aus Croncels, Cellini, Bismarck, Manks, Adersleber Calville, Reinette de Canada, Emperor Alexander.

Pears: Louise Bonne d'Avranches, Williams Bon Chrêtien, Beurré Diel, Bonne Grise, Fondante de Charneu, Poire Pastorale, Calebasse Bosc, Grosser Katzenkopf, Napoleon's Butterbirne, Nouveau Poiteau, Josephine von Mecheln, Gellert's Butterbirne, Madeleine d'Été Verte, Amanlis Butterbirne, Forelle d'Hiver, Pierre Pépin, Muscateller, von Tongre, Doyenné de Juillet, Dr. Jules Guyot, Blumenbach's Butterbirne, Clapp's Liebling, Beurré Clairgeau, Hardenpont's Winter Butterbirne, Vereins-Dechantsbirne, Duchesse d'Angoulême.

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(1) Lists of standard varieties to be encouraged in different fruit-growing regions. (*Ed.*)

Besides these varieties, there are a number of newer varieties which have not been generally tested and also many excellent so-called local varieties which are widely grown.

II. — During the last ten years, following the example of the German Fruit-Growers' Union at Eisenach, yearly courses have been started for the instruction of those who are to become promoters and teachers of fruit-growing in Germany. The lectures are given by practical and well-known growers and scientists, who give an account of their own experiences in the matters of fruit-growing, the fruit trade and the utilization of fruit. In these courses, while individual views are not disregarded, unity of teaching is aimed at, and in order to avoid contradictory instructions, a certain uniform scheme of instruction is adopted. Simple uniform methods, which bring the most profit to the fruit-grower, are always advocated in these courses.

As far as possible, practical fruit-growers and scientific men lecture alternately. The courses are held regularly every year at places which offer opportunities to the students to visit instructive and interesting fruit plantations, fruit-preserving factories, etc.

The subjects of the last course of lectures of the German Fruit-Growers' Union were: The Decrees and Work of the Chamber of Agriculture for the Promotion of Fruit Growing and the Fruit Trade. The Organization of Sale Associations. — Study of Soils. — The Science of Working and Fertilizing Soils. — Plant Anatomy and Physiology. — The Structure and Chemico-physiological Nature of the Soil. — Food and Manure Requirements of Fruit Trees. — Chemical Manures. — Climatic Conditions for Fruit Growing. — Care of the Food-Supplying Organs of the Fruit Tree. — Root Physiology. — Soil Bacteria and their Relation to Fruit Growing and Horticulture. — New Methods of Soil Aeration. — Watering Fruit Trees. — The Utilization of Fruit and Vegetables: Scientific Basis of the Different Methods of Treating Fruit and Vegetables. — Growing Vegetables for Preserving Factories. — The Best Fruit Varieties for the Preserving Industry and their Cultivation. — Preliminary Preserving of the Different Fruits for further Use in Factories for Fruit Preserves, Jams, Fruit Syrups, Jellies and Fruit Cheeses. — The Manufacture of Fruit Preserves. — Judging Preserved Fruits and Vegetables according to the Legal Requirements and the Legal Decisions hitherto in Force. — Potato Drying Plant — and its Use in the Manufacture of Preserved Fruit and Vegetables. — The Effect of the Composition of Water upon the Keeping of Preserves Boiled in it. — Forestry Schools: The Development of German Forestry Schools and their Influence on Fruit-Growing in Germany. — The Best Soils and the Most Economical Methods for Tree Nurseries. — Working the Soil in Nurseries and Fruit Plantations: Use of Cultivators and other Machines for Nursery Work. — Suitable Distribution of Nurseries. — The Growing of the Best and most widely used Stocks. — Best Grafts and the Time for Grafting.

The lectures are always followed by a discussion. The reports of the courses are published by the Ministry of the Interior in the *Berichten über*

Landwirtschaft under the title "Mesasures for the Promotion of Home Fruit Culture and of Fruit Utilization."

III. — Tours of instruction are made every year conducted by experienced men with a practical knowledge of the subject; German and foreign fruit farms are visited. The members are required to give an account of their observations and experiences. A selection of the most important facts is published.

IV. — Service of Information Concerning Fruit: In no other branch of agriculture do the prices for products of the same value vary so much in different districts as in fruit-growing. For this reason, a Service of Information has been established throughout Germany, which gives to all interested, from the flowering time till the gathering of the crop, information regarding the market prices and all important matters in the different fruit-growing districts of Germany. The Central Station of the Fruit Information Service is the German Fruit-growers' Union at Eisenach, which by means of its weekly gratuitous Report of the fruit-markets disseminates the accurate information supplied by about 130 reporters from 120 centres of information respecting the price of fruit and vegetables, the fruit supply, natural phenomena affecting the crops and prices, and the general condition of the market. The Chambers of Agriculture and the Fruit-Growers' Federations also publish similar reports which, however, confine themselves to giving information respecting their own field of work.

V. — The surest basis for the fruit trade is careful picking and grading and the right packing of the produce. Practical courses of instruction on these subjects are held every year in Germany, both for men and women.

VI. — Markets of specimen produce are very common in Germany, where not only the finest dessert fruit is sold, but also good, sound, cheap fruit for the working people.

VII. — Courses of instruction and apparatus for preserving fruit and vegetables are conducted by experienced teachers; women are now often employed in this work.

VIII. — The improvement and grafting of the different varieties of fruit is actively promoted in Germany by:

a) The careful choice of good, healthy trees producing a large crop of fine fruit, to serve as stock for the supply of scions and slips.

b) The recent breeding of improved German varieties of fruit. Of these I may mention: *Apples:* Berlepsch Gold Reinette; Minister von Hammerstein, an improvement on Landsberger Reinette; Adersleber Calville, a cross between Calville d'Hiver and Gravensteiner, von Zuccalmaglio's Reinette; Ernst Bosch. *Plums:* Bühler Frühzwetsche. *Gooseberries:* Neuwied Earliest; Hönings Earliest. *Strawberries:* Sieger; Deutsch Evern.

The following rules and prescriptions for raising new German fruit varieties have been drawn up at a meeting of Pomologists and noted breeders of new varieties of fruit, which was held at Eisenach.

a) Extensive scientific investigations must be made on the subject of the weakening of fruit trees with age.

b) The deterioration of old varieties makes the breeding of better new ones imperative.

c) The most widely grown varieties of fruit must be improved by taking cuttings for grafting only from the best trees.

d) It is important to aim at producing:

Among *apples*: strong-growing, healthy varieties, producing very heavy crops of market fruit — productive varieties ripening in August, with large, highly-coloured fruit — productive varieties ripening in September and October, with fairly large fruit of fine quality — productive varieties with fairly large fancy-grade fruit for winter table use — late--flowering, heavy-cropping, moderate-sized household and dessert varieties — good, heavy-cropping varieties resistant to woolly aphis — upright, robust varieties, with fruit not highly coloured, for roadside planting.

Pears: varieties ripening in August, good, heavy-croppers, with large fruit — large, heavy-cropping, extra-fine, coloured varieties, sound on the tree and suitable for winter dessert — heavy-cropping varieties, suitable for preserving especially whole.

Cherries: fine heavy-cropping Morellos for preserving.

Plums: heavy-cropping and early-ripening varieties, giving fine, large market fruit — good, heavy-cropping plums and damsons of moderate size, specially good for preserving, drying and jam-making.

Peaches: hardy, heavy-cropping, early varieties *coming true from seed*, with fine large fruit easily separating from the stone — hardy, heavy-cropping varieties, with fine and white-fleshed fruit *easily separating from the stone* and suitable for preserving. — hardy, heavy-cropping *mid-early* large-fruited varieties *with the flesh readily separating from the stone*.

Apricots: heavy-cropping varieties with firm yellow flesh, suitable for preserving.

Gooseberries: varieties *resistant to American Gooseberry Mildew*.

Red currants - *seedless* varieties.

Strawberries: ever-bearing, large-fruited varieties.

e) The breeding of varieties which come true from seed.

f) The popularisation of the best methods of pollination, so as to avoid chance crossing.

g) Improvement of wild stocks and of varieties suitable for intermediate grafting. At the invitation of the German Fruit-Growers' Union at Eisenach, many Horticultural Schools and Model Gardens and certain well-known pomologists and fruit-breeders are taking part in this work.

h) The obtaining of legal protection for new selected varieties of fruit.

IX. — The increased supply of the best varieties of dessert fruit is one of the chief features of the recent development of fruit-growing in Germany. The production of fruit of fine quality has made extraordinary progress in Germany during the last decade. The first place as regards yield is taken by bush apples on Paradise. In comparison with the standard the bush is of course shorter-lived and is more particular as to soil and attention, also it does not stand under-crops of bush fruit and vegetables as well as the former. But on the other hand, it fruits much earlier, bears larger crops and pays better, because more trees can be grown on the same area and its fruit is much finer and more perfect in shape and thus fetches a higher price. It is chiefly apples and peaches which are grown in bush form.

The commercial growing of fruit, especially of the finest highest priced dessert fruit, can only be practised in districts where the natural conditions are especially favourable for fruit-growing in general and for some given species or variety in particular. We already possess in Germany a large number of such fruit-growing districts, *viz.* for early plums : Bühl and the Bavarian Palatinate ; for cherries : Thuringia, Baden, Werder, Guben, and the Alte Land near Hamburg ; for small fruit : the Vorgebirge and Vierlanden near Hamburg ; for pears and apples : most of the German fruit-growing districts ; for peaches : the Rhineland, the Palatinate, Saxony and the whole of South and Central Germany where there are favourable exposed, warm positions to be had.

X. — The system of intercalary crops is steadily increasing in German fruit-growing, and their utility and advantage to the fruit trade is ever increasing. For intercalary and under crops the following are used: currants, strawberries, raspberries, gooseberries, various kinds of vegetables, chiefly beans, and also tomatoes and lilies-of-the-valley to send by post. Experienced and sucessful fruit-growers reckon to make an average net profit of £ 10 per acre, not including the fruit borne by the fruit trees under and between which the other crops have been grown. Many of these crops, under favourable circumstances, bring in twice or three times the profit stated above.

XI. — Fruit-growing on the railway embankments is continually increasing. A measure and example of this is given by the fact that in 1909, 94 000 fruit trees were planted in the Kingdom of Bavaria alone, *viz.* : 40 000 apples, 14 000 pears, 28 000 plums, 7 000 cherries, 3 000 agriots, 600 peaches and apricots, 2 000 walnuts and hazels and 200 quinces. Up to 1909, about a quarter of a million fruit trees had been planted on the railway embankments in Germany, of which the great number (about three-quarters) were apple trees, the rest being pears, plums, cherries, and morellos. The shape most used is the half standard, but both standards and bushes have been planted.

XII. — Cold storage depots for keeping fruit fresh for a long time, till a suitable opportunity occurs for its sale, have been established under the control and assistance of the German Fruit-Growers' Union. In this manner there is no necessity for the fruit market to be glutted at the time the crop ripens and for the produce to be sold at prices far below its value ; and these establishments have been of the greatest service to the growers sharing in them.

XIII. — The domestic utilization of fruit and the promotion of this by instruction courses held in the different fruit-growing districts of Germany by competent teachers of fruit culture, (many of whom of late years have been women) is continually on the increase. An attempt is now made to bring forward the domestic side more than had hitherto been done, and only such work is attempted as can be accomplished cheaply and with simple appliances, and which provides in a short time large quantities of tasty, well-preserved fruit and vegetables. The following are the subjects treated: jam-making — preparation of cheeses and jellies — making of fruit wines — bottling and canning of fruit — fruit drying — preparation of non-alcoholic beverages, such as fruit wines and syrups. The manufacture of the above preserves in factories increases every year in Germany; thus, factories, have been started with a plant capable of dealing with 50 tons of asparagus daily.

XIV. — Model fruit gardens, laid out by officials and Corporate Bodies or by the State and the provinces, have determined to give up growing many different varieties of fruit and paying attention to the cultivation of trees in special forms, and to become experimental fruit plantations. They aim at:

a) Discovering, by means of experiments in cultivating different varieties, those kinds of fruit which appear best suited for growing in the area served by the model garden and the production of grafts from the most valuable trees.

b) The right naming of widely-grown varieties of fruit, which are either wrongly named, or have various different names.

c) Testing the different stocks; the right distance apart for planting; the most suitable shape for the various species and varieties of fruit; model plantations with undercrops as demonstrations for commercial fruit-growers and farmers.

d) Manuring experiments with different chemicals in order to determine the best and the most efficacious amount to be used.

e) The control of enemies; testing control methods.

f) Amateur fruit-growing for the purpose of discovering the best kinds for the most varied purposes.

The model gardens are open to all seekers after information. Courses of instruction for fruit-growers and assistants are always being held on tree management, and the treatment, gathering, packing and utilization of fruit.

XV. — The fruit shows during the last ten years have been arranged chiefly with a view to the encouragement of commercial fruit-growing and providing Germany with home-grown produce.

Instead of the assortments of fruit of large size and exhibits of only 3 to 6 specimens, which only benefited exhibitors of the most numerous kinds without any regard to the value of the fruit, the exibitor is now required to furnish a ton or more of the produce of the few best varieties

To attain this end, the programmes of the German fruit exhibitions include competitions for the best and finest fruits of certain prescribed choice varieties in order to show the perfection attained by the German breeder of dessert fruit. Prizes are also offered for other things, *e. g.*: the representation of the kind of fruit culture practised by the exhibitor or by an entire fruit-growing district or province. Further, the exhibition of

Grading of Fruit by Size in Germany.

		Fancy	Grade I	Grade II
Apples.				
Class I	Weight of each fruit	over 250 gr. (9 oz)	160-250 gr. (6½-9 oz.)	120-180 gr. (4¼-6½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 200	200-275	275-400
Class II	Weight of each fruit	over 200 gr. (7¼ oz)	150-200 gr. (5½-7¼ oz.)	100-150 gr. (3½-5½ oz)
	Number of fruits to 50 kg. (110 lbs.)	not over 250	250-330	330-500
Class III	Weight of each fruit	over 180 gr. (6½ oz)	120 180 gr. (4¼-6½ oz.)	80-120 gr. (2¾-4¼ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 275	275-400	400-600
Class IV	Weight of each fruit	over 150 gr. (5½ oz.)	100-150 gr. (3½-5½ oz.)	60-100 gr. (2-3½ oz.)
	Number of fruits to 50 kg (110 lbs.)	not over 330	330-500	500-600
Pears.				
Class I	Weight of each fruit	over 250 gr. (9 oz.)	180-250 gr. (6½-9 oz.)	120-180 gr. (4¼-6½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 200	200-275	275-400
Class II	Weight of each fruit	over 200 gr. (7¼ oz.)	150-200 gr. (5½-7¼ oz.)	100-150 gr. (3½-5½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 250.	250-330	330-500
Class III	Weight of each fruit	over 150 gr (5½ oz.)	100-150 gr. (3½-5½ oz.)	60-100 gr. (2-3½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 330	330-500	500-800

such varieties, packed for the market, as are most suitable for given districts and of greatest commercial value.

XVI. — The interests of fruit-growing in Germany are promoted also by two new systems introduced by the German Fruit-growers' Union at Eisenach: a uniform method of labelling and a uniform grading according to size for the whole of Germany. Thus, the most valuable economic varieties of apples are divided into early-ripening or summer varieties (Nos. 1-15), autumn varieties (Nos. 16-40) and winter varieties (Nos. 41-99); pears are similarly divided.

The uniform method of grading by size leads to a universally recognized trade scale which is recognized also in the Law Courts in cases of dispute.

The accompanying table gives details. It is important that only the given number of fruit should go to the 50 kg. weight. In the case of fruits from the south (oranges, lemons, etc.) it has long been the trade custom to determine the value and quality of the fruit by the number to 50 kg.

A certain latitude is necessary regarding the weight and number of fruit of the different grades: this has been given in the table.

XVII. — Much progress has been made in fruit-growing in Germany; the following may be mentioned: new measures for controlling diseases and pests; legal enactments for the protection of fruit trees; experiments in manuring fruit trees with chemicals in order to ascertain the best kinds and mixtures; experimental planting to determine the most suitable species and varieties of trees for permanent cultivation; the careful selection (by reference to books of control and yield) of the best trees to supply slips for re-grafting inferior varieties.

This subject together with others which could not be treated at length within the limits of this article, is dealt with in many of the publications of the German Fruit-Growers' Union (Deutschen Pomologen Verein) at Eisenach, which may be obtained on application by those interested in the subject.

For years past, many millions of young well-grown fruit trees of the best selected varieties have been planted in Germany. The favourable climate of that country, the excellent management of the trees and the beauty and fine flavour of the produce place German fruit culture in the first rank. Supported by scientific men and by the merchant class, numerous well-instructed officials, inspectors and fruit growers are occupied in turning to good account all the latest knowledge which may serve to promote fruit cultivation.

The Manufacture of Butter and Cheese with Culture Starters in Italy

by

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The use of culture starters in the preparation of butter and cheese in Italy dates respectively from the years 1895 and 1903.

Butter. — In the summer of 1895 the late Prof. Giuseppe Sartori and I, were at Copenhagen, encouraged by the Minister of Agriculture, to study the Danish method of butter making with selected starters, This method, as is well known, consists in pasteurizing the cream with the object of killing or paralyzing the natural germs, which may be good or bad, and then adding a pure culture of certain determined ferments, which were shown in 1890 by Prof. Vincent Storch of the Agricultural Station of Copenhagen to be the specific agents in the ripening of cream.

In this manner the factors of chance and empirism were eliminated from the process of the souring of cream, which with the old methods used to take place naturally during the rising of the cream according to our methods, or was artificially brought about in centrifugated cream by the addition of sour buttermilk or of some other empirical starter, as was customary in the North of Europe.

On our return to Italy we hastened to divulge the salutary reform. I, who was chiefly interested from the scientific point of view, emphasized the hygienic and bacteriological significance of the process, in lectures held at the Agricultural Association of Lombardy, at the Athenaeum of Brescia, and at the Royal Italian Society of Hygiene. Sartori, who studied the question in its technical aspect, actively set to work to describe the practical execution of the new method in reports to the Ministry, to experiment it in the dairy of the Royal Agricultural School of Brescia, and to teach it and to spread it amongst producers by means of lectures, and verbal and printed instructions. And already in 1897 he was able to announce that the reform had been definitively adopted by several dairies (1).

The Ministry of Agriculture began to favour the propaganda with subsidies and by means of special competitions for butter prepared with culture starters (Lodi 1898, Milan 1906, Turin 1911).

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(1) See *Bollettino Ufficiale del Ministero di Agricoltura*, Rome 1897.

(Author's note).

The first to adopt the new process were the great dairies of the district of Milan among which the firms Antonio Zazzera of Codogno, Polenghi Lombardo of Lodi and Codogno and Locate Triulzi near Milan occupy most honourable positions. The example of these was soon followed by other firms, especially of Lower Lombardy (Mangiarotti of Lomello, Gallone of Milan Gianelli Majno of Mortara, etc). In fact this region produces more butter than any other milk-producing district of Northern Italy; it is here that owing to the distribution of landed property and to the favourable topographical conditions it is possible to collect the large quantities of milk necessary to the creation of great industrial establishments like those at San Fiorano, Somaglia, Acquanegra, Olmeneta, Secugnago, Sant'Angelo Lodigiano, Melegnano, Casalpusterlengo, Oftanengo, Rogoredo, Abbiategrasso, Borgosatollo, Soresina, Casalbuttano, etc. All these are localities in which important dairies were founded either independently or as branch houses of other firms, and in all of which the Danish method of buttermaking was adopted.

At the same time other regions of Italy, such as Piedmont, Emilia, Venetia, Friuli, Liguria are not without examples of large dairies in which selected butter starters are used, if not continuously at least intertermittently when required and according to demand; their number is always increasing. Quite recently a large Piedmontese dairy, Barberi of Moretta, has, with my assistance, adopted culture starters.

It is not an easy task to ascertain the quantity of butter made at present on the Danish system in Italy, as industrial firms do not like to give publicity to their affairs, partly through fear of heavier taxation. It may, however, be approximately deduced from the statistics of exports, admitting that the butter exported, about 78 700 cwt. per annum, is all made with culture starters. It is, however, to be noted that a portion of the butter exported, especially that for the French Riviera, is still prepared from cream allowed to rise and ripen naturally, while on the other hand butter made on the Danish system is demanded also by the home trade, thus proving the increasing recognition of the advantages offered by the new method.

As is well known, these advantages may be summarized as follows: more delicate aroma, greater constancy of type and improved keeping qualities. Of these the most generally recognised are the two latter and especcially the last, namely the greater resistance to turning rancid. Upon this resistance the greatest stress is laid in judging butters in shows and competitions. As for the aroma, the same observation has been made in Italy as abroad, especially in France. There are some farms in which the butter made in the old way turns out more sweetly scented than by the Danish method. Whether this depends upon special natural aromas or on special breeds of aroma-producing bacteria, both of which are destroyed by pasteurizing the cream and cannot be developed or replaced by the selected starters now in use, is a question requiring further study. Moreover it must not be forgotten that the development of the taste in butter made on the Danish lines is always slower than in butters made in the old way, and that on the other hand the unsatisfactory results of the Danish method are frequently due to the negligent and imperfect way of applying it. Some dairies which had abandoned it have returned to it after having introduced some opportune modification either in the pasteurizing process, or in the multiplication and choice of the ferments, or in the inoculation, incubation and acidification of the cream. As for the original cultures used in Italy. they come almost exclusively from abroad. Among the firms patronized, Blauenfeldt and Tvede of Copenhagen, Hansen also of Copenhagen and H. Berend and Co. of Wildeshausen deserve to be mentioned. Regarding the multiplication of the ferments and the ripening of the cream, it is not easy to know the methods adopted by the different dairies, as these like to keep to themselves their technical details which often contain the secret of their success. Besides, it is obvious that exactly the same rules cannot be followed in all cases, especially as the demands of the customers in the matter of flavour and degree of acidity of the butter have to be complied with.

But if there may still exist some uncertainty and some exceptions concerning the delicacy and pleasantness of the taste, in the matter of amount, purity and constancy of the flavour the superiority of butter made on the Danish system is being always more firmly established; this is demonstrated by the facts that the home consumption of butter made with culture starters is on the increase, and that the system is being utilized for the improvement of butters destitute of taste, as is the case sometimes in winter, or of second rate butters such as whey butter, especially when this is a by-product of the making of cheese resembling ewes' milk cheese. In this case the cream acquires an unpleasant taste and odour which can be attenuated, if not removed altogether only by pasteurization and by the addition of a good culture starter. In other words the use of culture starters is constantly gaining favour as a means of improving naturally inferior butters and raising them to the level of good butters.

Cheese. — In 1903, under the presidency of Senator Giulio Vigoni, an Association among cheese producers and traders was formed in Milan with the object of experimenting practically the methods proposed by me for the improved manufacture of cheese.

This method is based upon the same principles as those upon which the Danish method of butter making is founded; that is, using a milk which is bacteriologically pure and to which pure cultures of good cheese ferments have been added. Here, however, the task is more difficult for the two following reasons: in the first place for the purification of the milk, pasteurization cannot be relied upon in an absolute manner, it having been shown that the temperature to which milk must be raised so as to kill all the germs it may contain is injurious to its properties for cheese making: secondly, because while the ripening of cream, which is after all only a mere acidification, is very simple, the ripening of cheese is a very complex process of which we are still far from knowing all the factors and all the biochemical products.

Nevertheless my scientific and practival investigations had put me in possession of facts that seemed to me to be of immediate practical application for the improvement of the manufacture of at least the hard or cooked curd cheeses, the making of which as well as the micro-flora which accompanies their ripening being much simpler than in the case of soft cheeses. These facts may be summarized as follows :

1) By means of opportune hygienic measures which can be carried out in practice, it is possible, without having recourse to pasteurization, to obtain a milk relatively free from bacteria, and sufficiently so to allow of the useful addition of selected ferments. These measures must be taken *ab ovo*, that is by *preventing* the contamination of the milk (devoting attention to the feeding, to the cleanliness of the cows and especially of their udders, to clean milking etc), and they must be completed by *preventing* the multiplication of the bacteria in the milk (cooling and protecting the milk up to the moment of working it up).

2). The present knowledge on the ripening agents of cooked-curd cheeses is sufficient to allow of the substitution of the empirical ferments now used in cheese making (fermented whey, fermented milk, etc.) by pure cultures of certain ferments. Provided that in the choice of ferments the following scientific and practical facts relative to the making and ripening of hard cheeses be borne in mind : *a*) that in these cheeses a rapid lactic fermentation takes place without production of gas and accompanied by proteolytic processes. *b*) that their cooking temperature attains 50° C (122° F) and upwards. Consequently the bacteria to be chosen must be taken from good cheeses, and must possess the following general physiological requisites : they must be lactic ferments not producing gas, energetic, proteolytic and resistant to heat.

3. The use of selected ferments requires processes favourable to them. With this object it is necessary : *a*) to consider the most favourable conditions of temperature, moisture, etc., for their development and action ; *b*) to exclude every kind of empirical starter and of impure rennet that may neutralise the action of the culture starters; *c*) to abstain from all those expedients, such as the use of too high temperatures, of an excessive degree of acidity and of antiseptics which tend to control harmful germs but at the same time prove injurious to the useful ones.

Working on the above lines, the Association began in 1903 at the Trenno cheese factory near Milan to use culture starters in the preparation of the classical Italian cheese, *Parmesan* or *Grana*. From the very beginning success attended the new deparcture, so that already in 1906 at the Milan International Exhibition three year-old ripe experimental cheeses could be presented together with the control cheeses, and they obtained completely favourable judgment from two international juries. The authoritative "Milchzeitung" of Leipzig (1) said that it was the first time that a Commission of international experts could verify the results obtained, *with rigorously experimental methods*, by selected ferments, and convince itself of the possibility of exerting a favourable action on the quality of the cheeses made by introducing culture starters into practical use. Encuraged by the good results obtained with Parmesan of the Lombard type (Lodigiano) and of the Emilian type (Reggiano), the Association turned its attention to other types of hard cheeses, such as those of the Valtellina (Bitto), of the Bergamo district (Branzi), of the Friuli (Montasio), the cacio cavallo, the Swiss cheeses (Fribourg and Emmental) and margarine cheeses, and with all of them obtained further confirmation of the value of the method.

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(1) Year 1907, No. 9.

All who have tried and adopted it bear witness to the following advantages: 1) considerable reduction in the number of defective cheeses; 2) greater uniformity of characters; 3) improvement in the most esteemed qualities (eyes, softness, flavour); 4) improved keeping quality.

In 1905 the Association resolved to found a cooperative bacteriological laboratory, under my direction, for the preparation of selected ferments, in order to supply them to both members and non-members at cost price and in the case of scientific institutions, travelling lectureships of agriculture, etc., at reduced prices and even gratis.

By means of lectures, communications to national and international congresses, of exhibits at shows and competitions, and of advice given personally, or by printed leaflets, the modern principles of cheese-making founded on bacteriology and on hygiene were spread throughout the country. The results of researches and of experiments embodied in yearly reports are published in the Official Bulletin (1904 and following years) of the Ministry of Agriculture (which grants a subsidy to the Association). So that now it may be said that the knowledge concerning culture starters and their use has become public property.

In the last seven years (1906-1912) 56 629 doses of culture starters, each sufficient for 110 gallons of milk, were distributed. The figures for the several years are as follows: 1906, 2276; 1907, 6449; 1908,6261; 1909, 6564; 1910, 12114; 1911, 11609; 1912, 11356. The decrease of the two years 1911-12 is due partly to the smaller quantity of milk treated by several consumers on account either of the rise in the price of milk or of the foot-and mouth disease, and partly to the fact that some of the usual consumers suspended the manufacture of cheese in favour of the preparation of condensed and sterilized milk. Among the constant consumers of culture starters several of the best and most conscientious cheese makers and the principal industrial dairies are to be found (1).

Whilst at the Milan International Exhibition of 1906 the only cheeses made with culture starters were those of the above mentioned Association. at the Jubilee Exhibition at Turin in 1911 several cheeses made with culture starters were shown, also in the exhibits of the Province of Reggio at a meeting of cheese manufacturers and others interested in cheese, promoted by the Association in March 1912 at Milan, and to which twelve travelling lectureships, the Italian Association of members of the industry and trade of milk products, the National Union of Social Dairies, as well as numerous agricultural Societies, Chambers of Commerce, Provincial Councils, Agricultural banks, professors of dairying, agricultural members of the Chamber of Deputies and of the Senate, etc, had adhered, a resolution was adopted recommending agriculturists and the manufacturers of cheese to follow the new lines of cheese making based on the union of hygienic conditions of the dairy with selected ferments.

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(1) GORINI. *Rendiconti del Real: Istituto Lombardo di Scienze e Lettere.* Milano, 1912, p. 863.

We are therefore fully justified in affirming that the improved modern system of cheese making is now firmly established in Italy, not only in agricultural institutions and schools of dairying, but also in agricultural and industrial pratice.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

330 - Italian Law for the Protection and Increase of the Production of Live Stock in the Country.

Legge italiana per la tutela e l'incremento della produzione zootecnica nazionale. — *Gazzetta Ufficiale del Regno d'Italia*, Year 1912, No. 190, August 12, 1912; Year 1913, No 12, pp. 331-332, January 16, 1913. Rome.

The Royal Decree No. 1395, dated December 19, 1912, approves the Regulations for the execution of the Law No. 832 of July 6, 1912, concerning measures for the protection and for the increase of the production of animal husbandry in the country.

According to this law " The number of stallions in the State depots will be raised in five fiscal years to 1200. For this purpose the following sums are set apart for increasing the appropriations for this item:

1912-1913	£ 25 376	1915-1916	£ 44 409
1913-1914	£ 31 721	1916-1917	£ 50 753
1914-1914	£ 38 065		

In the selection of the stallions to be purchased special attention will be paid to the need of producing artillery horses (art. 1).

" In the budget of the Ministry of Agriculture, Industry and Commerce, beginning with the year 1912-1913, the sum of £ 7930 will be devoted to increase the appropriations for the following: Encouragement of the production of horses (prizes for stallions and brood mares; subventions for the purchase of breeding animals; sale of stallions and mares at reduced prices; prizes at races) and encouragement for the production of mules (breeding of asses; concession of donkey stallions; subventions for the establishment and working of stations of donkey stallions; prizes to breeders). " (Art. 2).

" With the object of increasing and improving the breeding of cattle, sheep, pigs and poultry the Minister of Agriculture, Industry and Commerce :

" *a*) Promotes the establishment of bull, ram and boar stations and subsidizes them, granting also breeding animals.

" *b*) Subsidizes the importation of breeding animals of improved races.

" *c*) Grants prizes to those breeders who, uniting in associations, establish special farms for the raising of calves on mountain pastures or in other appropriated localities.

" *d*) Organises directly : 1) prize shows for breeding animals, and subsidizes those shows that are organised by local bodies or committees : 2) prize competitions for the cultivation of forage plants and for the systematic feeding of live stock, and subsidizes those promoted by local bodies ; 3) prize competitions for the use of motors to replace animals for drawing agricultural machines and implements.

" *e*) Promotes and subsidizes exibitions of animals for the butcher.

" *f*) Favours the development of mutual insurance associations against mortality in live stock, and of dairy associations and of their unions or federations, facilitating their establishment and their operations, by means of contributions in money and by rewarding with prizes the best organized and most efficient ones.

" *g*) Promotes and subsidizes the establishment and the working of associations and cooperative societies formed among producers for the organization of general warehouses with annexed markets for wool.

" *h*) Subsidizes the associations of agriculturists formed for carrying out undertakings for the improvement of animal husbandry.

" *i*) Founds and subsidizes new institutions for animal husbandry and poultry stations and depots where their need is recognized, considering the conditions of the different regions in this respect and the eventual contribution of local bodies.

" *l*) Grants contributions for the establishment of animal husbandry sections attached to the travelling agricultural lectureships.

" *m*) Promotes and encourages by means of lectures, temporary courses, scholarships, and in other ways, the propaganda in favour of the intensification of the yield of animal husbandry. " (Art. 3).

" Upon every head of cattle that is slaughtered before its first permanent incisor is up, a tax of 2 Lire (about 1*s* 7*d*) is levied by the commune. Of the sum thus raised one quarter is left to the commune and the rest devolves to the State " which devotes it to the objects set forth in art. 3 of the present law. (Art. 4).

331 - Institution of a General Inspectorship of Agriculture in Tunis.

Institution d'une Inspection Générale de l'Agriculture en Tunisie. — *Journal Officiel Tunisien*, Year 31, No. 14, p. 198. Tunis, February 15, 1912.

By decree of February 13, 1913, a General Inspectorship of agriculture for the technical agricultural services has been founded at the

General Direction of Agriculture, Commerce and Colonization. The Director General of Agriculture is charged with the execution of the decree.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES

332 – Agriculture in the Gold Coast

Colonial Reports; Annual, No. 725. Gold Coast, Report for 1911, pp 49 London, 1912

Agricultural Exports. — The total value of all seaborne exports from the Colony during 1911 amounted to £3 792 454 against £2 697 706 in 1910.

The agricultural exports in 1911 were as follows:

	Quantity	Value £
Cocoa	88 987 324 lbs	1 613 468
Cola Nuts	5 791 931 »	93 000
Copra	771 tons	13 2[illegible]
Cotton, raw	9 701 lbs	236
Concentrates	1 064 456	13 924
Guinea Grains	99 380 »	2 000
Gum Copal	80 042 »	1 110
Ivory	1 607 »	385
Lumber (Native timber)	13 073 396 sup ft	138 521
Palm Kernels	15 254 tons	175 691
Palm Oil	1 610 209 galls	128 916
Rubber	2 668 667 lbs	219 417

The most notable increases in the value of exports are: cocoa (£746 897), cola (£15 383): and the most notable decreases are: rubber (£139 429), palm oil (£32 472). The cause of the decrease in the rubber export is assigned to the fall in prices in the European markets; the fall in the value of palm oil is explained by the attraction held out to farmers by the more easily won profits of the cocoa industry.

Lands — The bulk of land in the Colony belongs to the tribal "stools", and theoretically there is no land without an owner. The Crown posseses no waste land in the Colony, but certain lands have been acquired by the Government from time to time, mostly under the provisions of the Public Lands Ordinance, 1876, which legalises compulsory acquisition for the services of the Colony on payment of reasonable compensation. Of recent years deeds have come into common use, especially in land transactions between natives and Europeans.

Agriculture. — Agriculture is the staple industry of the interior. The chief food crops are yam, cassava, maize, amankani (a species of eddo), and plantain. The most important cultivated product grown for export is cocoa. The industry is almost entirely in the hands of native farmers. Agricultural stations in charge of European curators are established at Aburi, Tarquah, and Assuantsi in the Colony, at Coomassie in Ashanti, and at Tamale in the Northern Territories. European and native instructors under the control of the Director of Agriculture are constantly travelling and advising the native farmers as to the cultivation and preparation of the various products of the soil.

Reports on the following subjects were furnished by the Imperial Institute to the Government of the Gold Coast during 1911. A sample of Nyasaland Upland cotton grown at Labolabo was of good quality, although rather uneven in strength. Recommendations were made regarding the acclimatation of this cotton in the Gold Coast. A sample of native cotton from the Dagomba District of the Northern Territories was of excellent colour but somewhat harsh and rather short. Three samples of imperfectly prepared Hibiscus fibre were received from Tamale. These fibres would be saleable as substitutes for jute, but they are inferior to the latter fibre on account of their interlacing character. Botanical specimens of the plants yielding these fibres were identified at Kew as *Hibiscus sabdariffa* L. *H. cannabinus* L., and *H. squamosus* Hochr.

A sample of Funtumia biscuit rubber prepared with formaldehyde contained a little more resin and protein than is desirable, but was otherwise of good quality, and was valued at 6s. 10d. to 7s. per lb. in London with fine hard Para at 6s. 11d. per lb. Samples of the roots and stems of three gutta-yielding plants were examined, but only one of them contained sufficient gutta to make extraction on a commercial scale worth consideration. The roots and stem of this plant contained respectively 11.35 and 2.10 per cent. of gutta.

Five samples of cocoa which had been prepared by different methods were received for valuation; the fermented cocoa was regarded as superior to the unfermented samples (1),

Samples of cola nuts derived from *Cola acuminata*, *C. Johnsonii* and *C. verticillata* were found to contain respectively 2.1, 0.8, and 0.8 per cent. of total alkaloid, expressed on the dried nuts. This sample of *C. acuminata* is remarkable in containing a high percentage of caffeine.

Botanical specimens of the plant yielding "Baco" or "Abaku" nuts were identified at Kew as ***Dumoria heckeli***, A. Chev.

333 - Agriculture in Indo-China in 1911.

L'agriculture en Indo-Chine en 1911. — *Ministère de l'Agriculture, Direction de l'Agriculture, Bulletin mensuel de l'Office de Renseignements agricoles*, Nos. 11 and 12, pp. 1493-1509 and 1715-1727. Paris, November-December 1912.

I. *Cochin-China.* — Over a large extent of this country, rice, which is the chief crop grown, depends on the rain for its irrigation; in consequence, years or irregular rainfall of with prolonged periods of drought result in poor harvests or famines (2). In the provinces of Baclieu and Rachgia, where the soil is very fertile, but consists of recent alluvium (and thus only productive if the rainfall is regular and abundant), the network of irrigation canals, already very extensive, is being gradually increased, although slowly owing to the laborious nature of the task. When these irrigation works are finished a vast tract of land will be turned to account.

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(1) See No. 1301, *B.* Sep. 1912. (*Ed.*).

(2) See No. 1612, *B.* Dec. 1912. (*Ed.*).

Owing to the uncertainly of the rice yield, the natives are turning their attention more and more to growing other crops. Plantations of maize, sugar cane and fruit trees are constantly increasing, especially in east Cochin-China ; maize has also been grown successfully in the province of Chaudoc. The plantations of pineapples, sugar cane, mangostan, areca nuts and mangoes in the province of Thudaumot produce an abundance of fruit, which is much appreciated in the markets of Saigon and Cholon, and which is even beginning to be exported to China and Singapore. The sugar cane suffers much from the attacks of insect larvae; and only yielded a poor crop in 1911. Pepper tree plantations exist on the Hong-Chong and Phuquoc district, as well as in the province of Baria. The following crops are also cultivated in Cochin-China: tobacco, sweet potatoes, haricot beans, vegetables, betel, coffee, indigo, manioc, mulberries, earthnuts, etc. In the province of Gocong, an attempt has been made to grow coconuts.

Native colonisation is increasing steadily. In one year 37 000 acres have been granted in concessions between 25 and 1 200 acres, and 12 000 acres in concessions of from 1 200 to 7 500 acres. Some of the central provinces are at present entirely under cultivation. The natives are now turning their attention to the immense tracts of uncultivated land situated in the provinces of Rachgia, Baclieu, Cantho, and Soctrang.

European colonization, though almost stationary in the western provinces, tends to develop increasingly in the east. In a few months over 75 000 acres of the State land have been sold in the province of Bienhoa alone, for the purpose of making *Hevea* plantations. The large plantations of rubber trees belonging to Europeans are over 50 in number and cover 150 000 acres of red land and 34 500 acres of grey land (loam). There are already 830 000 trees on the red land and more than a million on the grey. Ong-yêm rubber met with the approval of the judges at the recent exhibition in London and this has given rise to many requests for it.

The future of colonization in Cochin-China chiefly depends on the solution of the labour problem, the local supply being clearly inadequate. By a decree of March 14, 1911, a Commission of planters was appointed to consider suitable means for promoting immigration to Cochin-China and to study the establishment of Colonizing Bureaus.

For the last two years, attempts have been made to remedy this scarcity of labour by the use of agricultural machines (1). Hitherto the results obtained have not been very conclusive, as the tackle employed was too heavy, and sank in as soon as the soil was a bit damp. It is necessary to devise a light type of machine, working a narrower strip of ground. The use of machines requires a dry compact soil; to attain this, excess of water (whether rainwater, or due to tidal floods) must be prevented and attention paid to hoeing and ploughing, practices usually neglected by the native. An association has lately been formed for the solution of the question of mechanical cultivation in Cochin-China.

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(1) See No. 121, *B*. Feb 1913. *(Ed.)*.

Injury done by insects, birds and rats, especially the two last, is always to be feared. The attempts made to find an efficacious means of controlling rats have proved abortive.

The admnistration continues its measures for the destruction of the floating plants or "luc binh" (*Eichhornia crassipes*) (1), which threatens to prevent the traffic on a large number of the water-ways and have even invaded the rice-fields at some places, Numerous groins made along the course of the rivers and canals, caught 235 100 cub. ft. of "luc-binh" in January, 323 200 cub. ft. in February and 434 200 cub. ft. in March. The results of this system being so satisfactory, it will be generally adopted throughout Cochin China.

II. *Tonking.* — The Agricultural and Commercial Services have been increased and reorganized by the decree of April 7, 1910. An attempt is being made to provide the natives with technical instruction, especially in reeling and weaving silk, plaiting hats and mats, etc. The Experimental Stations of Than-ba and Phu-lang-thuong distribute selected silkworm eggs. At the Than-ba Station certain diseases of coffee are being studied at present, as well as the prevention of ravages caused by insects, the improvement of native cultivation by means of seed selection, and the cultivation of maize, rice and sugarcane. At La-pho, textile and oleiferous plants are under investigation, while the Phuxa Station of Agricultural Hydraulics is occupied with the question of manuring rice. The Stock-breeding establishments of Hanoï and Nuoc-hai have continued breeding native horses and cross-breds. Horse-breeding has increased much in the mountainous district. At Hanoï sheep-breeding is practised with much success, some of the animals coming from the Malay peninsula, others from Java. Where breeders have been provided with sheep, *e. g.* at Sontay, Chobo and Bac-Kant, the animals have proved to be strong and disease resistant, and to provide good meat.

The exports of rice and maize are on the increase. The cultivation of European food plants and fruit trees is also increasing, even far from the great centres.

The budget of 1911 reserved 156 823 acres of forest, which bring sup the total area of reserved forest land to 337 012 acres. In 1910, 1 493 344 cub. ft. of timber were felled and 1 725 624 cub. ft. of wood were burnt for charcoal, as against 1 422 745 cub. ft. and 1 010 172 cub. ft. respectively in 1909.

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(1) See No. 1390, *B.* May 1911; No. 1167, *B.* Aug. 1912. (*Ed.*).

The irrigation works, begun in 1898. are now extended to the whole delta. With a view to obtaining precise information as to the greatest advantage which can be expected from irrigation, an experimental field has been made (in accordance with the provisions of a decree dated November 3, 1909) in the districts of Phu-xa and Phu-gia (Hadong province). The results hitherto obtained point to the advisability of the diminution of the irrigation coefficient adopted for the Kep canal, and show that irrigation alone, together with the ordinary native methods of cultivation, is sufficient to produce average crops in districts, in which, at certain times of the year, nothing could before be raised. They also show that chemical manures, when used on the rice fields cultivated by the natives, do not as a rule give appreciably higher returns.

III. *Annam.* — Tobacco is chiefly grown in the provinces of Thanh-hoa, Vinh and Dong-hoi; cinnamon in Than-hoa and Quang-nam (wild cinnamon becomes increasingly rare); tea is much cultivated in Quang-nam and Binh-dinh, and rubber in the province of Hatinh. The cultivation of coconut palms is encouraged.

In 1911, the total area colonised by Europeans was 97 600 acres (4 080 acres more than in the preceding year), and the total of the cultivated area was 25 450 acres.

The propagation of *Ficus elastica* has been continued on a large scale; many slips have been taken from young trees raised from seed brought from Saigon; these succeeded perfectly, which was not the case when slips were used from the local Annam variety: this can only be propagated by layers. From May until the end of August, incisions were made in trees of *Ficus elastica* of from 7 to 8 years of age and with an average circumference of 32 inches at a height of 3 ft. 3 in. from the ground. These trees had never been tapped before, and 330 gr. of smoke coagulated rubber per tree was obtained. Acclimatization experiments with Venezuelan Kapok are being successfully prosecuted, especially at the Yendinh Station. This same Station introduced in 1906 Kelantan sheep, which have become perfectly acclimatized. The various Annam Experiment Stations distributed from June 1910 to July 1911, 296 226 layings of selected silkworm eggs.

IV. *Cambodia.* — The sericultural services is making rapid progress; in 1910-11, 121 851 layings of selected silkworm eggs were distributed (more than double the amount distributed in the previous year) the average weight of the native cocoon has increased in seven generations from 643 mgr. to 1 200 mgr.

Rice, pepper, tobacco, maize and cotton are the principal crops; the cultivation of maize is making rapid progress. Stock breeding is one of the chief sources of revenue of the country.

V. *Districts of Kouang-Tchéou-Wan.* — The principal crops are as follows: earthnuts, (increasing very fast — the demand exceeding the supply), potatoes, sugar cane, hemp, cotton, mulberries and sweet potatoes, which are the chief article of food consumed by the natives. Many rushes are exported, either made into mats and sacks, or in the form of packing material. Selected silkworm eggs from the Sericultural Station of Phu-lang-thuong have been introduced into this district, silkworm rearing has been very successful, and the silk, though rough on account of the primitive methods employed, is of good quality. The Administration is engaged in promoting silkworm rearing among the natives.

334 – Agricultural Production of New Zealand in 1912.

New Zealand Department of Agriculture, Commerce and Tourists Annual Report 1912, pp. 229 + figs. Wellington, N. Z., 1912.

Agricultural production.

Total area of the Dominion (including the Chatham and other islands) 66 791 680 acres.

Area in occupation (1910-1911).

	Acres
Crops	1 729 504
Fallow Land	209 973
Sown grasses; Land ploughed	5 000 226
» not ploughed	9 214 515
Native grasses, etc.	23 972 236
Orchards, Plantations, Gardens, etc.	111 672
Total area in occupation	40 238 126

Area under Cultivation (1910-1911).

	Acres
Corn and Pulse Crops	1 015 822
Green Crops	713 682
Sown Grasses	14 214 741
Fallow Land, Orchards, Plantations, Gardens, etc.	321 645
Total area under cultivation	16 265 890

Number of Holdings (*1 acre and over*) (1910–1911) . . . 73 876

Area under different Crops.

Corn and Pulse Crops	1910-1911	1911-1912	Green Crops	1910-1911	1911-1912
	acres	acres		acres	acres
Wheat	336 389	215 528	Potatoes	29 023	28 248
Oats	593 396	403 668	Turnips	450 959	440 202
Barley	38 131	31 644	Mangolds.	14 082	19 764
Maize.	18 857	6 094	Rape	208 057	213 691
Peas and Beans	17 336	—	Carrots	2 363	—
Hops, Rye, Vetches, Linseed, etc.	11 713	—	Beet.	279	—
			Other Green Crops . .	8 919	—
Total . . .	1 015 822	—	Total . . .	713 682	—

Live-Stock, 1911.

Horses	404 284
Cattle:	2 020 171 (633 733 Dairy cows).
Sheep.	23 996 126 (1 819 339 Merinos; 22 176 787 Longwools)
Pigs	348 754
Angora Goats	6 119

Number of animals slaughtered in 1912.

	At ordinary slaughterhouses	Under inspection	
		Abattoirs, etc.	At Meat export Slaughterhouses
Cattle	67 680	85 687	69 654
Calves	1 285	10 262	3 128
Sheep	313 285	591 068	2 285 174
Lambs	38 150	103 410	3 050 548
Swine	56 392	154 206	21 493

Agricultural Exports in 1912.

	Quantity	Value £		Quantity	Value £
Wool . . . . . lb.	182 883 067	6 579 074	Hemp. . . . . tons	18 094	310 884
Butter. . . . . cwt.	327 282	1 776 440	Tow. . . . . . . »	2 823	23 289
Cheese. . . . . »	463 610	1 297 088	Timber . . . sup. fl.	95 710 967	468 181
Lamb . . . . . »	1 167 980	1 750 236	Kauri-gum. . . tons	6 952	368 228
Mutton . . . . »	1 068 881	1 197 594	Fungus . . . . cwt.	2 925	6 136
Beef . . . . . . »	500 022	250 304	Wheat . . . . bu.	1 123 730	197 623
Salted beef . . »	11 929	13 303	Oats . . . . . . »	314 254	37 502
Live-Stock.	16 364	190 685	Barley. . . . . . »	133 604	29 229
Preserved Meats cwt.	64 642	136 433	Beans, peas and maize . . . . »	275 949	66 731
Rabbits and Hares »	91 540	78 041	Bran and pollard tons	1 235	5 901
Bacon and Hams »	2 506	6 538	Seed, grass and clover . . . . cwt.	18 396	40 011
Hides	174 106	159 835	Flour . . . . . tons	167	1 403
Sheep and Rabbit skins	17 650 180	676 407	Hops . . . . . cwt.	1 874	11 594
Tallow . . . . tons	25 821	566 373	Potatoes. . . . tons	1 307	6 439
			Chaff, hay and straw . . . . »	166	1 115
Sausage - skins (casings) . . . . cwt.	24 516	66 801	Fish and oysters. .	—	33 989

Field experiments in cooperation with farmers are decidedly popular. The Department of Agriculture, in consultation with the farmer, sets out the place and supplies seed and fertilizers. The farmers provide the land and the labour and receive in return the crops; the experiments are supervised by officers of the Department. In 1912 the number of farmers who participated was 400, and the number of plots 5205. The experiments embrace a number of combinations of fertilizers and many plants, especially fodder plants and cereals, and they have shown among other results that silver-beet is an excellent forage plant and that lucerne deserves to be much more widely grown in New Zealand.

Experiments are in course for regrassing the vast areas which have been denuded by fire, overstocking, and by rabbits in Central Otego, in the Mackenzie region, in the pumice lands of the central part of North Island, and in the gum lands of North Auckland. The first have been enclosed with a wire netted fence to ensure control of rabbits, and a proportion of each has been sown to various grasses; the most promising results were obtained with cocksfoot, "chilian fescue" (*Festuca dumetorum*) and common couch.

The Government has offered a bonus of £12 000 to reward inventors who may provide improved machinery for the preparation of the fibre of the New Zealand hemp (*Phormium tenax*); this is at present effected by a machine which has hardly been modified for half a century.

Manawatu is the most important district in the production of this hemp, and Toxton is the largest grading station. In 1912 it turned out 36 892 bales (against 33 176 in 1911) and 9'457 bales of tow (against 7 829 in 1911).

The average prices of New Zealand hemp during 1911-12 were: good-fair, £17. 5*s* per ton; fair, £16 5*s* per ton. Tow: first, £8 5*s*; second, £7 10*s*; third, £6 15*s* oer ton. All the above prices f. o. b. Wellington.

The area under orchards is rapidly increasing: it was about 36 000 acres in 1912, against 34 000 in 1911 and 28 500 in 1908. Vineyards occupied 779 acres in 1911 and 663 in 1908-9. Of late years the grading and packing of fruit have improved very much; this is in a great measure due to the instruction in these subjects provided by the Department. Cool storage of fruit is growing in favour. Co-operative fruit-testing plots have been planted. There is a great demand for apples for export and it is anticipated that this branch of exportation will soon develop considerably; the government encourages the planting of apple orchards. In the fiscal year ending March 31, 1912, New Zealand exported £3 334 worth of fruit and imported £441 387 worth.

In 1912 twenty new factories were built in New Zealand for the manufacture of cheese, seven for the making of butter and one for the production of casein, the first in the Dominion.

The practice of systematically testing cows' milk for butter-fat throughout the whole year has rapidly spread since the Department of Agriculture founded several cow-testing associations.

A number of cheese factories pasteurize the whey before returning it to the suppliers of milk, with the object of avoiding the spread of tuberculosis in calves and pigs.

In some cases New Zealand butter has been found to develop a "fishy" flavour. It has been demonstrated that fishiness is very apt to develop when the cream from which the butter was made contains too high a percentage of acidity, that is, more than 0.3 per cent. in cream containing 40 per cent. of butter fat.

In Great Britain, and in New Zealand and some other countries, legal enactments provide that butter shall not contain more than 16 per cent. of water; the Commonwealth of Australia has recently fixed the limit at 15 per cent.; 1985 samples of butter were tested for water at the various grading posts and the average water content was found to be 14.25 per cent.

The following table shows the number of bee-keepers and hives, with the quantity of honey and wax produced during the year as ascertained at the census of 2nd. April, 1911.

Number of Persons keeping Bees	Number of Beehives	Honey produced during Year	Beeswax produced during Year
—	—	—	—
11 002	71 584	1 457 272 lbs.	26 061 lbs.

Taking 5*d.* per pound for the honey and 1*s.* 3*d.* per lb. for the wax, the value of the output for the year would amount to £32 113 12*s.* 11*d.* The honey exported for the twelve months ended 31st. March 1912 was 115 759 lbs., valued at £2 255.

At the Wallaceville Laboratory, among other work, experiments have been carried on in the direction of ascertaining the effects of ergot on livestock, with the result that sheep did not show any sign of ergotism while cattle were affected.

Other investigations were made on bush sickness. All the evidence gathered points to the condition being one of malnutrition rather than disease, and that probably a deficiency of available iron is the cause of the trouble. The disease disappeared from the pumice land pastures where it had been rife when these were top dressed with soluble iron salts and with phosphates.

Protection of agricultural produce. — One of the greatest pests of agriculture in New Zealand is the rabbit. In the settled districts and on the land under the administration of the Rabbit Boards of Hawkes Bay and of the East Coast the rabbit nuisance is under control. The business of trapping for export is firmly established in some districts and in others poisoning is practised.

The two most injurious weeds in New Zealand are the blackberry and the Californian Thistle. It is hoped to control the first by means of a native insect belonging to the genus *Tortrix,* and the second by parasitic fungi. During the year numerous specimens of the following weeds were sent in from various parts of the Islands: Mediterranean rocket (*Eruca sativa*), black mustard (*Brassica nigra*) and lantana (*Lantana camara*).

Systematic spraying for the control of insect and fungus pests is compulsory by law. Woolly aphis and apple and pear scab in orchards, wheat black-mould, wheat mildew and grass rust in wheat, and Irish blight in potatoes have been reported.

The inspection of all fruits, plants, vegetables, etc., that are imported is compulsory.

335 - Importation into Germany, in 1912, of Produce from the German Colonies.

Die Koloniale Rohstoffversorgung des Deutschen Reiches. — *Deutsche Kolonialzeitung,* Year 30, No. 6, p. 86. Berlin, February 8, 1913.

The following data are taken from the official statistics (*Amtliche Reichsstatistik,* December 1912).

Colonial Products	Importation into Germany from all countries 1912	Importation from the German colonies		
		1912	1911	Colony
	lbs.	lbs.	lbs.	
Coffee	385 808 500	385 808	1 212 541	German E. Africa (Usambara).
Cacao	121 254 100	(1) 2 733 729	3 262 838	Togo; Kamerun; Samoa.
Cotton	(2) 1 102 310 000	2 866 006	—	German E. Africa; Togo.
Sisal hemp . . .	7 072 421	5 004 487	—	German East Africa.
Rubber	(3) 45 415 172	257 058	—	Togo.
		4 505 141	—	Camerun.
		1 887 816	—	German East Africa.
Cedar Wood . . .	(4) 12 191 549	837 756	—	» » »
Mangrove-bark . .		3 152 607	—	» » »
Copra	404 014 252	15 893 106	—	German Australasia (Samoa excluded).
		4 830 322	—	Samoa.
Coconut kernels .	576 298 691	34 467 029	—	German Africa.
Palm oil	31 268 125	568 792	—	» »
Earthnuts	154 323 400	440 924	—	» »

(1) Worth about £ 188 000.
(2) » » » 24 600 000.
(3) » » 8 568 000.
(4) 11 353 793 lbs. imported from America.

336 - Export of Danish Agricultural Products in 1912.

The Danish Export Review, Vol. XVIII, No. 1, pp. 3-4. Copenhagen, January 1913

The following figures are supplied, by the State's Statistical Bureau

Butter, Cream and Milk.

	1912 Million lbs.	1911 Million lbs.	Average price for 1912
Butter . . .	over 187*	197	1s. 1*d.* per lb.**
Cream . . .	little under 60	44	
Milk	over 18.7	23	

* Of which about 6.6 mill. lb. packed in tins.
** About 3 % higher than in 1911.

In the ordinary form of packing barrels the following quantities of butter were exported in 1912:

about 169 ½ million lbs. to Great Britain.
• somewhat over 5 ½ million lbs. to Germany.
» » 6.6 » » » Austria.

In 1911, 1910, 1909 and 1908 the butter export to Great Britain was respectively 178,9 181,5, 184.1 and 187,2 million lbs. For the same period of time England's total consumption of butter from abroad or from her colonies taken as a whole has been diminishing or keeping stationary. The export of cream and milk is confined to Germany; the export of butter in tins takes place chiefly to transatlantic and other distant countries. About 19 per cent of the total export from dairy farming, which represents a butter quantity, of about 200 million lbs., went to countries other than Great Britain; some years ago the equivalent percentage for other countries only amounted to about 5 per cent.

Pork and Bacon.

	1912 Million lbs.	1911 Million lbs.	1910 Million lbs.	1909 Million lbs.	1908 Million lbs.	1907 Million lbs.
Fresh pork	14.3	—	—	—	—	—
Bacon	262.9	—	—	—	—	—
Salted pork in barrels	4.4	—	—	—	—	—
Totals	281.6	251.9	213.4	209	239.8	212.3

Offals:

Export in 1912

	Million lbs.
Heads and feet of pigs	16.5
Hearts, liver and plucks	9.9
Guts	12.1
Stomachs	3.3

The principal quantity of the exported meat from pigs is prepared as "bacon" *i. e.* lightly salted pork in bales. Towards the close of 1911 there began a comparatively important rise in the export of fresh pork, which in 1912, 1911 and 1910 was respectively 14.3, 3.3 and 1.1 million lbs. The bacon export goes entirely to England, but only 2.2 millions lbs. of fresh pork went to that country, the chief quantity going to Switzerland, Germany and Holland. Whilst in 1911 only 5.5 million lbs. of bacon went to countries other than Great Britain, in 1912 about 16 million lbs. were exported to other countries. The export of offals is also rising as regards the total export value.

Cattle and Beef.

Exports.

	1912	1911	1910	1909	1908	
Live cattle	125 000	153 500	140 800	124 000	121 600	heads.
Beef and veal	57.7	28	36.3	34.1	24.2	million lbs.

The large import in 1911 of about 29 000 head of Swedish cattle, which was principally slaughtered for export, was diminished in 1912 by 8000 head, so that the export surplus has risen considerably more than the actual export. All the live cattle, with the exception of some 800 to 900 head which were sent to Russia, went to Germany. The beef was exported to:

	1912 million lbs.	1911 million lbs.
Germany	49.5	20.9
Switzerland	3.3	4.4
Norway	3.3	1.1
Great Britain	1.7	1.1

Horses.

Exports.

1912	1911	1910	1909	1908
24 900*	28 500	26 100	22 700	18 600

* About 22 500 horses and 2400 foals.

The import of foreign horses for the last three years was about the same, namely 14 to 15 thousand.

Eggs.

Exports (in million score).

1912	1911	1910	1909	1908
over 19	21.5	20.5	over 19	over 21

The decline in the egg export in 1912 is due to the cold winter and spring months of 1912. About 5 per cent of the export in 1912 went to countries other than Great Britain.

The agricultural products mentioned in this article represent between 4/5 and 5/6 of the entire export. In 1011 its value represented over £23 967 000, whilst other agricultural goods and goods not of agricultural origin were exported for about £5 500 000. The estimated value for 1912 for the above-mentioned articles shows a rise of about £1 600 000; for each of the two preceding years the rise was about the same. Higher average prices for the year have been paid for nearly all the products derived from Danish domestic animals.

337 - Exportation of Agricultural Produce from the State of Rio Grande do Sul, Brazil.

MINSSEN, G. Alguns aspectos do Rio Grande rural em 1912. — *Estado do Rio Grande do Sul Boletim Technico da Secretaria de Estado dos Negocios das Obras Publicas*, 1912, No. 5, pp. 193-211 Porto Alegre.

These are: comparative statistics for 1910 and 1881 of the exportation of the principal agricultural products, a summary description of the various regions of the State, of the condition of the principal crops, of stock breeding, and of animal industries.

Exports in 1910 (*).

Vegetable products	£	animal products	£
Mate	200 500	Dried meat. . .	1 745 692
		Hides	1 021 150
Manioc flour .	196 651	Tallow	340 800
Tobacco . . .	172 125	Lard	229 200
Beans	586 350	Milk	183 641
		Canned meat. .	122 675

(*) The milreis is valued at 18 *d* (The average value of the milreis in 1909 was 17 3/4 *d* *The Statesman's Year-book for* 1912, p. 680). Mate to the value of £ 915 110, tobacco. worth £ 1 609 785 and skins and hides for £ 2 418 107 were exported from Brazil in 1910. *Ibid.* p. 679). *(Ed.)*.

338 - The Organisation and Present Condition of Agricultural Instruction in Belgium.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

VANDER VAEREN, JULIEN. L'organisation et la situation actuelle de l'enseignement agricole en Belgique. — *Revue des Questions scientifiques*, Series III, Vol. 23, pp. 237-271. Louvain, January 20, 1913.

After a short review of the historical development of Agricultural Instruction in Belgium, the writer describes its present organization. He first of all draws a distinction between two large divisions of agricultural schools; those for youths and boys and those for girls. In both, the grades of instruction are different: there are colleges for young men, and similar institutions for girls, agricultural secondary schools of higher and lower grade and also higher and lower elementary schools.

Belgium possesses two agricultural colleges, the Agricultural State Institute of Gembloux and the Agricultural Institute of the University of Louvain. In order to be admitted at either as a regular student, it is necessary to have completed the intermediate course of studies and, further, to have passed an examination in mathematics. The course of study is three years at both Institutes; after this comes a fourth optional year, during which the student can pursue his studies further in one of the following branches: 1) Agriculture and Instruction; 2) Agricultural Chemistry and Industry; 3) Forestry. On passing the examination at the close of the three years' course, the student receives the title of "ingénieur agricole". The Gembloux Institute, which opened in 1861 with 37 students, had 175 in the session 1911-12; while the Louvain Institute had 200 students in 1910-11, as against 15 in 1878 when it was opened.

As agricultural intermediate schools of higher grade, the writer mentions the free Agricultural Schools of Carlsbourg, La Louvière and Leuze, and the State School of Practical Agriculture at Huy. In these are educated agents for medium-sized farms, smaller agricultural industries, etc. The course in the two first lasts for three years, but is only two years in the Huy Institute. The students must have been through a higher grade elementary school or an intermediate lower grade school. The teaching staff is chiefly composed of "Ingénieurs agricoles". In 1910-11, the number of students was as follows: Carlsbourg 52; La Louviere 29; Leuze 97; Huy 29, in all therefore 207.

The 26 agricultural divisions, which are attached to free colleges, intermediate schools, etc., are agricultural intermediate schools of lower grade, as is understood by the writer. Their curriculum includes all agricultural subjects; these are mostly taught by "ingénieurs agricoles". The course in these schools is also a three years' one. The students are liberally supplied with apparatus and materials, 30 to 50 per cent of the cost of these being defrayed by the State. The number of students in these schools rose from 275 in 1900 to 822 in 1911. The writer lays special stress upon the fact that in these schools, as in the previously mentioned Institutes, no instruction is given in practical agriculture, for the students, being mostly peasants' sons, acquire practical experience on their fathers' farms.

The writer considers the following as elementary agricultural schools of higher grade:

1. "Sections professionnelles agricoles primaires" (Professional agricultural Schools). 2. "Sections professionelles ambulantes" (Agricultural travelling schools). 3. Schools, sections and courses of instruction in agricultural machinery. 4. The Agricultural course of instruction in the State institutions and free institutions. Today there are 28 "sections professionelles agricoles primaires", which might well be entitled agricultural winter schools: these are opened every week for 2 or 3 afternoons during 3 or 4 winter months, when the schools are independent, or for 2 to 3 ½ hours on 3 to 5 evenings, if the school is attached to an elementary school.

The curricula of these schools must, as far as possible, be suited to the requirements of the district. The teachers are, in many cases "ingénieurs agricoles", but they are usually elementary teachers, who possess a certificate for agricultural instruction. In 1911-12 the number of students was 1062.

Travelling agricultural schools were first started in 1904; there are now ten of these in Belgium. Instruction is also given in these schools only during the winter months and generally by specialists, such as "ingénieurs agricoles", veterinaries, experts in agricultural machinery, etc.

Hitherto they have been attended by 25 to 40 farmers of from 17 to 35 years of age.

Belgium has three schools of agricultural machinery, at Mons, Leuze and Namur. The course is held in the winter months and lasts one winter at Mons and Namur and two at Leuze. The instruction is both practical and theoretical. Most of the teachers are "ingénieurs agricoles".

In the winter 1911-12, 50 students attended at Mons, 81 at Leuze, and 25 at Namur, this being the first year of the existence of the school.

In the Fleurus and Avelghem agricultural machinery departments, which are attached to other Institutes, 22 and 30 students respectively received instruction during the same winter.

In the provinces of Brabant and Liège there have been 4 travelling schools of agricultural machinery for a year; and during this first year they were attended by 22 or 23 students on an average.

In the provinces of Limburg, Namur and Luxemburg several courses of from 10 to 15 lectures with demonstrations were held on agricultural machinery; these were attended by 20 to 50 students each.

In 50 State schools and in the same number of free intermediate schools, one or two hours have been devoted weekly to agricultural science; these were attended by 2862 scholars during the school year.

The writer considers that the numerous lectures on different branches of agriculture constitute arrangements for lower grade elementary agricultural instruction. These are held in villages especially during the winter, by State agriculturists, "ingénieurs agricoles", agricultural teachers, etc.

The 116 agricultural libraries, and the free information supplied to the farmers by the experiment stations and State agriculturists are also mentioned.

Since 1911, special agricultural instruction for training country housekeeping teachers has been given in the fifth optional year at the Teachers' Colleges of Wavre-Notre-Dame and Héverlé. Belgium possesses 14 country house-keeping schools with a two-years' course; these were attended in the school year of 1911 by a total of 436 pupils. The 5 departments for country housekeeping, which were attached to other Institutes, had 99 pupils during the same year. Further, there are 13 travelling housekeeping schools, which give a 3 to 4 months' practico-theoretical course in different districts. So far, departments of instruction in country housekeeping are only attached to 10 elementary schools.

In addition, during the last 10 years numerous lectures have been given to the female agricultural population on agricultural subjects especially interesting to women.

In the teachers' colleges, which are under the administration of the Ministry of Arts and Sciences, the study of agriculture is obligatory in the third year, as the curriculum of the elementary schools includes one or two hours' weekly instruction in this subject. Vacation courses are held annually from August to September in the Teachers' Seminaries of Nivelles and Ghent; the teacher who attends these and passes an examination in the Easter holidays, obtains a certificate "of competency for imparting instruction in agriculture".

In conclusion, the writer mentions that the authorities of the province of Hainant opened a school in 1911 at Ath for agriculture and stock-breeding; the course is a three-years' one. The province of Brabant in 1911-12 opened two more winter schools at Court-St-Étienne and Tirlemont; these were each attended the first year by from 25 to 30 students.

339 - The New Bill for the Advancement of Agricultural Instruction in Canada.

Communicated by T. K. DOHERTY, *Commissioner of the International Institute of Agriculture in Canada.*

A Bill of the greatest importance to agriculture in Canada was introduced in the House of Commons on January 24th, 1913, by the Hon. Martin Burrell, Minister of Agriculture. The new measure is the practical application of the "Agricultural Aid Act" passed in April, 1912, giving power to the Governor-in-Council to make grants to the Provinces for the encouragement of Agriculture.

On the passing of the Act in Aid of Agriculture, Dr. C. C. James, Deputy Minister of the Ontario Department of Agriculture, was appointed to investigate agricultural conditions in Canada and ascertain in what way the federal authorities could best assist the provinces in developing Canada's basic industry. Dr. James has consulted with the provincial governments and with the men in charge of the various agricultural institutions of the country and the results of his work is the new Bill now before the House of Commons.

The new law is "for the purpose of aiding and advancing the farming industry by instruction in agriculture." The money voted to the provinces under it will be devoted exclusively to agricultural education. The object of the Act is to increase the efficiency and equipment of the agricultural colleges, establish agricultural schools, dairying and horticultural schools, and short courses in agriculture, and to initiate agricultural teaching in the public schools and work by travelling or located qualified instructors. Educational work will also be carried on by means of demonstration trains and the training of teachers in domestic science and nature study.

According to the terms of the new Bill $10 000 000 are to be given to the provinces to be expended on agricultural education during the next ten years. 700 000 will be allotted the first year and this amount will be increased by $100 000 annually until 1917, from which year until 1923 $1 100 000 will be provided yearly.

Speaking broadly the division of the money among the provinces will be on a population basis. There are, however, slight modifications of this principle. In the first place, $20 000 a year is to be set aside to be divided among such veterinary colleges as grant degrees and come up to a required standard. In addition $20 000 will be allotted to each province regardless of population. With the exceptions mentioned, the provinces will share as follows:

	1913. —	Yearly Increase.	1917-23, —
Prince Edward Island	$ 26 529.85	$ 1 306	$ 31 753.73
New Brunswick	41 509.93	4 902	64 117.87
Alberta	46 094.95	5 219	66 970.91
British Columbia	47 334.76	5 467	69 202.57
Manitoba	51 730.05	6 346	77 114.09
Nova Scotia	54 288.45	6 858	81 719.21
Saskatchewan	54 296.29	6 859	81 733.32
Quebec	159 482.40	27 896	271 068.32
Ontario	195 733.32	35 147	336 319.98

It is provided that if in any year any province is not prepared to use all its grant, the unused remainder shall be held by the Dominion for future use by that province, or until such time as it can make good a claim, or show good cause for its payment. If from lack of educational machinery, or for any other reason, any province is not able to submit a satisfactory scheme, the Federal Government would be prepared to formulate one for such province's assent.

340 - The Land Cultivation Commission and the Land Cultivation Office in Schleswig-Holstein.

AGRICULTURAL INSTITUTIONS

Landeskulturkommission und Landeskulturstelle in Schleswig-Holstein. — *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 8, pp. 57-58. Berlin, February 24, 1913.

The province of Schleswig-Holstein has formed an organization for the reclaiming of waste lands and moorland; it is under the president of the Government district and in close connection with the Chamber of Agriculture.

The work of the *Land Cultivation Commission* consists in collecting and making known the results obtained in the cultivation of waste lands and in promoting efforts in this direction by means of advice and research; the *Land Cultivation Office* is occupied with the especially practical side of the question.

In the province of Schleswig-Holstein there still remain about 104 000 acres of waste land to be reclaimed, of which 82 000 acres are high-moors and 21 500 acres consist of mineral soil. About 9 300 acres of these areas are State property. Nearly 70 400 acres are about to be improved, including only 378 acres of high-moor. Hitherto over 240 000 acres of fen and of mineral soil have been improved at an outlay of nearly £1 323 000. The province will provide £2 940 in the new budget of the Ministry of Agriculture for the further promotion of the cultivation of the large areas of waste lands which still exist.

AGRICULTURAL SHOWS AND CONGRESSES

341 - Agricultural Exhibitions and Competitions in 1913.

Argentine Republic.

Sept. 1-18. Palermo, Argentina. — The "Sociedad Rural Argentina" will hold its yearly live stock show at Palermo from September 1 to 18, 1913. Besides live stock, the show will include forage of all sorts, fruit, vegetables, etc., produced in the country, as well as agricultural machinery and industrial plant, both national and foreign. Applications for admission are to be addressed to the Sociedad Rural Argentina: Buenos Aires, Florida, 316.

Nov. 9-12. Palermo. — The same association organises also: *A.* a fat stock show; *B.* a milch-cow show.

The first includes two divisions. 1. For breeders: *a*) cattle: Durham and crosses; Hereford and crosses; Aberdeen-Angus and crosses; other breeds; cross-breds; *b*) sheep: Lincoln and similar breeds; blackfaced and other breeds; *c*) pigs; *d*) poultry. The prizes offered are the following:

Prizes for each class.

	Championship	1st Prize	2nd Prize	3rd Prize	Mentions
	£ s	£ s	£ s	£ s	£ s
Cattle (individual)	43-17	43-13	35- 2	26- 6	11- 7
Sheep (groups of 5)	21-18	21-18	17-11	13- 2	8-15
Pigs	21-18	10-10	8-15	4-13	4- 7
Poultry	—	4- 7	3-10	2-12	17

Two championship prizes will be awarded to cattle: one to the best live animal, the other to the animal that has yielded most at the butcher's test.

2. The second division of the fat stock show is reserved to small farmers, and it is proposed thus to encourage the fattening of one or a few head of cows, pigs or sheep. There will be a championship prize of £87 14*s*. for the best head of cattle of all breeds, and prizes for the various classes about equal to those of the first group.

B. The show of milch-cows will include pure breeds and crosses. The cows must not be more than 7 years old and they must have stood the tuberculin test.

Austria.

May-October. Vienna. — Exhibition of the Austrian Adriatic Region. This exhibition is intended to acquaint the public with the history, the art and the production of the region. It will include, among other items, sections for agriculture, forestry and industries. For information apply to: "Arbeits Komitee, Oesterreichische Adria Ausstellung," Rotunde, Vienna.

May 11-16. Prague. — Exhibition organized by the Central Agricultural Association for the Kingdom of Bohemia. Address "Exhibition Committee, Central Agricultural Association for the Kingdom of Bohemia," Prague.

May 24-June 1. Vienna, at the Prater. — 32nd National Horse Show. Address: "Ausstellungsbureau", Schauflergasse 6, Vienna 1.

September. Vienna. — The Imperial and Royal Agricultural Association (K. K. Landwirtschaftsgesellschaft) of Vienna is organizing an exhibition of breeding and of production stock which will include sections for agricultural machinery and implements.

Belgium.

August 24-31. Antwerp. — Agricultural Show.

September 21 to 23. Manage, Hotel de Ville. — General Horticultural Exhibition. — Market gardening, Fruit-growing, Floriculture and connected Industries.

Canada.

July 8-13. Winnipeg. — Competition of Agricultural Motors connected with the Annual Exhibition of the "Canadian Industrial Exhibition Association."

August-September. Toronto. — Annual Canadian Exhibition. Address: Exhibition Department, City Hall, Toronto, Canada.

France.

April 11-18. Caen. — Annual Exhibition of the Poultry Association of Lower Normandy. Address: M. Langevin, Secretary, 72 Rue de Bayeux, Caen.

May. Lyons. — International Urban Show. Horticulture forms the 40th section and is divided into three classes: 1. Gardens; 2. Flowers; 3. Floral Decorations of Towns and Gardens. Address: Dr. Jules Courmont, Hotel de Ville, Lyon.

May 1-4. Saint Nazaire. — National Poultry Show organized by the Saint Nazaire Poultry Association. Address to the seat of the Association: Place Saint-Marceau, Saint Nazaire (Loire-Inférieure).

May 1-4. Bourges. — Poultry Exhibition of the Poultry Breeders' Association of the Cher. For information: M. Guerrier, banker, Bourges (Cher).

May 21-26. Paris. — General Exhibition.

May 25-June 1. Nancy. — State competition of the East of France organized by the French Horse Society.

May 31-June 5. Périgueux. — General Horticultural Show organized in connection with the seventeenth congress of the Friends of Roses, French Society of Rose-growers (June 1 to 3), by the Horticultural and Agricultural Society of the Dordogne. Address: Count de Lestrade, President of the Society, at Périgueux.

June 8-30. Bar-le-Duc (Meuse) — Exhibition organized by the Horticultural Society of Bar-le-Duc.

June 26-July 6. Vichy. — Competition of the South-East of France organized by the French Horse Society.

July 18-27. Boulogne-sur-Mer. — Competition of the North of France organized by the French Horse Society.

September. Jonville, Haute-Marne. — General Horticultural Exhibition organized by the Horticultural Society of the Haute-Marne.

October. Puiseux Farm, Seine-et-Oise. — Competition of Mechanical Tillage. Experiments organized by the Society of the Agriculturists of France under the patronage of the French Committee of Mechanical Tillage. Cultural and mechanical observations will be made. A sum of about £800 will be devoted to these experiments. There will be no classification nor awards; nevertheless some indemnities will be granted to makers and representatives who take part in the experiments.

November 8-15. Epinal. — Chrysanthemum and autumn product Show, organized by the Horticultural and Vine-growing Society of the Vosges. Address: the President, 1 Rue Thiers, Epinal.

November 19-23. Moulins. — Poultry Exhibition organized by the Poultry-breeders' and Agriculturists' Society of the Bourbonnais and of the Centre. Particulars: M. Buvat, President, 8 Avenue Victor Hugo, Moulins (Allier).

German South-West Africa.

May 24. — Agricultural Exhibition at Windhoek, German South-West Africa. The Exhibition will include: South African breeds of stock; dairy products; plant products; agricultural machines and implements. For particulars apply to the Geschäftsführender Ausschuss für die Landwirtschaftliche Ausstellung, 1913, Windhoek, German South-West Africa.

Germany.

April 14-16. Munich. — Thirty-first market of Carriage, Saddle, Breeding and Draught Horses.

April 24. Berlin. — Exhibition of Fat Stock and Horse Show.

May 29-June 2. Königsberg. — Agricultural Show (Landwirtschaftliche Provinzial- und Jubiläumsausstellung). For particulars apply to Landwirtschaftskammer, Königsberg.

June 5-10. Strasburg. — Thirty-sixth Exhibition of the German Agricultural Society (Deutsche Landwirtschafts Gesellschaft).

June 7-15. Breslau. — Fruit and Vegetables Show.

June 11-13. Cologne-Merheim. — Provincial Horse Show organized by the Chamber of Agriculture of the Province.

October 4-20. Dortmund, Westphalia. — Second Provincial Horticultural and Gardening Show. For applications for entries and for other particulars address " Geschäftsstelle des Obstbau-Verbandes " in Herford, Unter den Linden 7.

Holland.

July. Boskoop. — Horticultural Show.

Italy.

April 12-22. Casal Monferrato, Piedmont.—National Exhibition of typical Italian wines, organized by the Society of Italian Vine Growers.

May 10-19. Rome. — Villa Umberto I, National Flower, Plant and Fruit Show. For particulars address: Associazione nazionale italiana per il movimento dei forestieri, Sezione di Roma.

Portugal.

Lisbon. — International Poultry Show. For particulars apply to M. Manuel de Ameida e Castelno-Bramo, rua da Sociedade Pharmaceutica, 37, Lisbon, Portugal.

Russian Empire.

August to September. Khabarovsk, Amur Province, Siberia. — An Agricultural and Industrial Exhibition is to be opened at Khabarovsk in July or August 1913 for a period of two months. It is intended to present as complete a picture as possible of the actual condition of the Amur region and will include: Articles relating to the study of the geography, natural history, and economy of the region; produce of the farming, forest, mining, fishing, hunting, manufacturing and cottage and artisan industries; articles imported into and exported from the region, etc.

August to September. Jurieff, Livonia. — Two agricultural shows will be held at Jurieff in 1913. The first will be opened in August. For information, apply (in German) to the "Präsident des Nordlivländischen Ausstellungskomitets," Jurieff, Livland, Russia. The second, devoted especially to the peasantry, will be open from August 29 to September 1 and is organized by the Estnische Oekonomische Genossenschaft at Dorpat, Livland, Russia.

South Africa.

May 22-24. Agricultural Show at Pretoria.

May 30-31. Agricultural Show at Rustemburg, Transvaal.

June 4-5. Agricultural Show at Wolmaransstadt, Transvaal.

June 25-27. Agricultural Show at Pietermaritzburg, Natal.
July 2-4. Agricultural Show at Durban.

Spain.

May 21-26. The National Society of Breeders (Asociación general de Ganaderos) organizes a Stock Show and an Exhibition of National Dairy Produce; an Exhibition, open to foreigners also, of Agricultural Machines and Implements. For particulars apply to Secretaria de l'Asociación de Ganaderos, 30, Calle de las Huertas, Madrid.

Sweden.

May 15-September 31. Malmö. — Exhibition of the Baltic Countries. General and industrial exhibition with a section for agricultural machines. The exhibition is mainly devoted to the countries bordering the Baltic: Sweden, Russia, Germany and Denmark. For particulars apply to Styrelsen för Baltiska Utställningen, Malmö, Sweden.

United Kingdom (1).

April 14, 15. Dublin, Ball's Bridge. Spring Show of the Dublin Royal Society.

May 14, 15. — Newark Agricultural Show, Newark. C. T. Baines, Secretary, 52, Lombard-Street, Newark.

May 14-16. — Somerset County Agricultural Association, Taunton. W. R. J. Greenslade, Secretary, 3, Hammet-street, Taunton.

May 21-23. — Devon County Agricultural Association, Barnstaple. E. R. Callender, Secretary, The Warren, Starcross, South Devon.

May 28,29. — Leicestershire Agricultural Society, Victoria Park, Leicester. P. L. Kirby, Secretary, 25, Horsefairstreet, Leicester.

May 28-30. — Royal Ulster Agricultural Association, Balmoral, Belfast. Kenneth MacRae, Secretary, Balmoral, Belfast.

June 3-5. — Herefordshire and Worcestershire Agricultural Society Hereford. T. H. Edwards, Secretary, Corn Exchange Offices, Leominster.

June 4, 5. — Northamptonshire Agricultural Society, Towcester. Entries close May 10. J. E. Lovell, Secretary, Harpole, Northampton.

June 10-13. — Royal Counties Agricultural Society, Windsor. F. Simmons, Secretary, Basingstoke.

June 24,25. — North-West of Ireland Agricultural Society, Lacky-road, Londonderry. Entries close June 4. Oliver Bond, Secretary, Castle-Street, Londonderry.

June 25, 26. — Doncaster Agricultural Society, Doncaster Race Common. Entries close June 7. F. H. Chafer, Secretary, 9, Market-place, Doncaster.

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(1) See also No. 102, *B.* Feb. 1913. (*Ed.*).

July 1-5. — Royal Agricultural Society of England, Bristol. The prizes amount to over £10 000. Special efforts are being made for the success of the "Overseas exhibit." Application for further particulars should be made to Thomas McRow, Secretary, Royal Agricultural Society of England, 16 Bedford Square, London, W. C.

July 8-10. — Peterborough Agricultural Society, Peterborough. Entries close June 2. J. E. Little, Secretary, Queen-street, Peterborough.

July 16-18. — Lincolnshire Agricultural Society, Lincoln. Entries close June 7. W. Frankish, Secretary, St. Benedict's Square, Lincoln.

July 23-25. — Yorkshire Agricultural Society, York. Entries close June 7. John Maughan, Secretary, Blake-street, York.

July 31, Aug. 1, 2, 4. — Royal Lancashire Agricultural Society, Burnley. Entries close June 9. E. Bohane, Secretary, Derby House, Preston.

August 26-29. — Royal Dublin Society, Ball's Bridge, Dublin.

Oct. 21-24. — British Dairy Farmers' Association (Dairy Show), Royal Agricultural Hall, London, N. Entries close September 12. F. E. Hardcastle, Secretary, 12, Hannover-square, London, W.

Nov. 1; 3-7. — Brewers' Exhibition, Royal Agricultural Hall, London. Entries close October 14. Jno. G. Hardy, Secretary, 46, Cannon-street, E. C.

Nov. 20-22. — Norfolk and Norwich Christmas Show Association, Norwich. Entries close October 25. Caleb Barker & Co., Secretaries, East Harling, Norfolk.

Nov. 29, Dec. 1-4. — Birmingham Cattle Show, Bingley Hall, Birmingham. Entries close October 20. W. H. Lythall, Secretary, Bingley Hall, Birmingham.

Dec. 8-12. — Smithfield Club, Royal Agricultural Hall, London, N. Entries close October 1. E. J. Powell, Secretary, 12, Hannover-square, London, W.

Dec. 15,16. — Suffolk Fat Cattle Club, Ipswich. Entries close November 12. Robert Bond, Secretary, 6, Butter Market, Ipswich.

United States.

September 17 to October 1. Chicago. — Third International Exhibition of Cold Storage Plant. For particulars apply to 819 Exchange Avenue, Chicago, Illinois.

International Competition for a Beet Lifter and Topper organized by the Great Western Sugar Company, Denver, Colorado, United States. The competition is open until March 1915, but the Company may at any time before such date close the competition and award the prize if a practical machine is presented and if the trials have given satisfaction.

The Association of the German Sugar Industry (Verein der Deutschen Zuckerindustrie) had offered for 1911 and 1912 a prize of 10 000 Marks (about £500) for a lifting and topping machine answering the requirements of the Association; but only a partial prize of 5000 Marks (about £250) has been awarded. A new competition will be held a few years hence after the prizes of the Great Western Sugar Company have been awarded.

342 - **Agricultural Congresses.**

National Dairy and Cold Storage Congress at Ghent. — This will be held during the 1913 International Exibition. Corresponding Secretary of the Congress: O. André, 59, Rue des Arquebusiers, Bruxelles.

Third International Cold Storage Congress, New York, Washington, Chicago. September 14 to 24, 1913. — Information can be obtained from the Secrétariat de l'Association Internationale du Froid, 9 Avenue Carnot, Paris; the Secretariat of the American Cold Storage Association, 431 South Dearborn Street, Chicago, and from the Secretariat of one of the Associations, or National Committees, affiliated to the Association Internationale du Froid.

Fifth International Congress of Rice-Growing at Valencia, Spain, in 1914.

CROPS AND CULTIVATION.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

343 - **Occurrence and Nature of Carbonized Material in Soils.**

SCHREINER, O. and BROWN, B E. — *United States Department of Agriculture, Bureau of Soils, Bulletin* No 90, pp 1-28 Washington, December 1912.

An examination was made of that portion of the organic matter in soils which is soluble neither in water, nor in alkali, nor in any other ordinary solvent, and which remains visible to the naked eye as small black particles subsequent to treatment with solvents. Such particles were isolated from the soil mass by a system of hydraulic screening and of sedimentation in liquids of different specific gravities, and finally by a separation under the microscope. On careful examination they could be classed under six headings:

1) Plant material of organic structure.

2) Insect and other material of organic structure.

3) Charcoal particles.

4) Lignite particles.

5) Coal particles.

6) Other material, some of which suggested intermediate stages of formation.

These types of insoluble organic matter were found to exist also in the finer soil fractions, and black particles as a whole were invariably found, not only in a large variety of surface soils examined, but also in subsoils even to a depth of 15 and 50 feet.

The question of the origin of these dark carbonacous particles is considered. The occurrence of transition stages suggests their formation *in situ* from animal and vegetable remains by a process of slow carbonisation, and of infiltration and deposition of organic matter from soil water. Other agencies which would contribute such material to the soils are suggested: *viz.* forest fires, the erosion of coal seams by water or ice with subsequent deposition, and the disintegration *in situ* of rocks containing veins or seams of such material.

344 – **The Influence of a Preceding Crop on Nitrification in Soil.**

LITTLEION, L, T. and BIZZELL, J A. Department of Soil Technology, Cornell University, Ithaca, N Y. - *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 2, pp. 136-138. Easton, Pa., Feb. 1913.

The study of the principles of crop rotation will necessitate the investigation of the effect of plant growth on the soil. The writers have suggested (*Journal of the Franklin Institute*, Jan. and Feb., 1911, pp. 1-16, 205-220) that certain higher plants have a distinct influence on the process of nitrification in the soil; that this influence varies in intensity with plants of different families, and at different stages of growth. It was found that in a soil on which maize was growing the nitrates were sometimes higher at certain periods than in a similar soil on which no plants grew. *Phleum pratense* maintained uniformly a very low nitrate content in the soil throughout the growing period.

The question then arose whether the higher plants exerted any influence on the activity of the nitrifying bacteria after the plants had been removed. To test this, plots that were used for studying the effect of plants on the nitrate contents of soils in 1910 were kept bare in 1911 until July 1st. To keep down the weeds the plots were disc harrowed. Samples of soil were taken from the sections of the plots that were planted and bare in 1910, and the borings were made to a depth of 8 in. from the surface, and again from 8 to 16 in.

Nitrates in Planted and Unplanted Sections of Plots, Average for the Growing Season, 1910.

Plot Nos.	Crop	Nitrates per million of dry soil	On basis of nitrates in bare soil = 100	Nitrogen in crop. lbs. p. acre
3612, 13, 22, 23.	maize	167	123	3.5
	none	136	100	
3614, 15, 24, 25.	potatoes	104	96	42.7
	none.	108	100	
3616, 17, 26, 27.	oats.	90	71	28.7
	none.	126	100	

The small maize crop is partially responsible for the high nitrate content of the maize soil, but this high nitrate content has also been found in maize soil in previous years when the crop was good. Again, nitrates are higher in the potatoes soil than in the oats soil, although the former crop removed 50 per cent. more nitrogen. The nitrate content of a planted soil is not determined by the total quantity of nitrogen removed by the crop, but by a number of factors, of which one appears to be a direct influence which each species of plant exerts on the activity of the nitrifying organisms.

Nitrates in Soil Planted the Previous Year and Soil Unplanted, free from vegetation until July 1st, 1911.

Plot Nos.	Crop	May 1		June 5		June 28	
		First 8 in.	Second 8 in.	First 8 in.	Second 8 in.	First 8 in.	Second 8 in.
3612, 13, 22, 23.	maize	51.5	53.4	77.9	44.6	40.5	34.0
	none	48.1	52.3	68.0	44.0	40.3	30.1
3614, 15, 24, 25.	potatoes	31.3	26.0	49.8	26.4	28.6	23.9
	none	42.7	43.0	79.7	42.6	35.2	29.4
3616, 17, 26, 27.	oats	22.7	20.7	41.1	33.0	22.1	21.6
	none	32.3	39.6	68.4	34.8	33.6	31.9

The nitrates on the bare soil are in the same order as on the planted plots; except in the case of maize, they are lower on the planted soil than in the bare plots. The nitrates are highest in the soil previously planted to maize, next in that planted to potatoes, and lowest in that planted to oats.

Ratio of Nitrates in Bare Soil to Nitrates in Soil of Same Plots Previously Planted.

Plot Nos.	Crop	Surface 8 in.			Second 8 in.		
		May 1	June 5	June 28	May 1	June 5	June 28
3612,13,22,23.	maize	108	114	100	102	101	112
3614,15,24,25.	potatoes	73	63	81	60	62	81
3616,17,26,27.	oats	70	60	66	53	95	68

To obtain this statement of the nitrates in the planted sections of the plots in terms of the nitrates in the unplanted sections taken as 100, the nitrates in both planted ends of the four plots planted to the same crop are averaged; the result is divided by the average for the nitrates on the unplanted sections of the corresponding plots. This furnishes the most accurate means of comparison, as it removes more effectively than any other method the local variations in the nitrate content of the soil. There is a distinct and characteristic difference in the nitrate content of the soil previously bearing the different plants. While the experiment covers only one season the differences would seem to be too large and well defined to be accidental.

On July 1st the plots were drilled to millet, the entire plot being planted. The growth of millet was in each plot markedly better on the sections of the plot that had been in crop the previous year than on the unplanted section.

Growth of Millet on the Plots Planted to Different Crops the Previous Year, on the basis of the growth on the oats plots taken as 100, Sept. 8, 1911.

Soil treatment		Plot No.	Growth	Plot No.	Growth	Average growth
Maize	no lime	3 612	37	3 622	62	49
	lime	3 613	47	3 623	71	59
Potatoes	no lime	3 614	60	3 624	81	70
	lime	3 615	65	3 625	88	76
Oats	no lime	3 616	100	3 626	100	100
	lime	3 617	100	3 627	100	100

Comparison of Nitrates in Soil Planted to Certain Crops and the Growth of the Millet on the Same Plots, June 28, 1911.

Crop in 1910	Relative nitrate content	Relative growth of millet
Oats	59	100
Potatoes	67	73
Maize	100	54

Nitrate in Unplanted Sections of Plots Limed and Not Limed.

Plot Nos.	Soil treatment	Nitrates in soil per million			
		May 4	June 5	June 28	Average
3612,22	no lime	40.5	61.2	41.8	47.8
3613,23	lime	54.8	74.9	38.7	56.1
3614,24	no lime	59.9	76.9	34.3	50.3
3615,25	lime	45.4	82.5	36.0	55.0
3616,26	no lime	28.5	51.7	36.2	38.8
3617,27	lime	36.2	85.2	40.3	53.9

It is evident that although the previous crop influences greatly the nitrates content of the soil, the growth of millet is not increased thereby. Nitrates are not the limiting factor in the growth of millet on the experimented soil. Lime increases the growth of millet and also the formation of nitrates, but apparently its beneficial action must be due to some cause other than its influence on nitrate formation.

Concluding, the relation of the nitrate formation to the growth of millet on this soil is a separate problem, probably peculiar to this particular soil. But the interesting condition exists that, of the crops used in the experiments, each had a certain and distinct influence on nitrate formation following the removal of the crops, and on the growth of millet also following their removal; but the effectiveness on the influence is directly opposite. It is not to be expected, however, that this opposite effect would obtain in all soils, since the presence of an abundance of nitrates would under some circumstances throw the influence towards a better growth of the succeeding crop. There is thus presented a problem in crop rotation. If the influence of a certain kind of plant on the formation of nitrates, after its removal, holds for soils other than the one used in the present experiment, this influence may be an important factor in crop rotation. That other, and under some conditions more potent, influences than nitrate formation obtain is also indicated by this experiment.

MANURES AND MANURING

345 - The Changes in Soil Due to Manuring.

1 MASCHHAUPT, J G Onderzoek naar de veranderingen, welke door plantengroei en bemesting in den bouwground teweeggebracht worden, I Rijksland bouwproefstation te Groningen — *Departement van Landbouw, Nijverheid en Handel, Directie van den Landbouw, Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstations*, No. XII, pp 48-71 (66-71) + figs 8 The Hague, 1912

2 HUDIG, J Het ontstaan van schadelijke afwijkingen in humusrijke zandgronden, als gevolg van bemesting minerale stoffe Rijkslandbouwproefstation te Groningen — *ibid*, pp 83-138 (132-138) + 3 figs

G. J. Mulder (*Scheikunde der bouwbare aarde*, III, 497-498, 1860) has already drawn attention to the fact that in manuring more care has been paid to the effect on the crop than to the effect on the soil. Recently Sjollema and Hudig (*Verslagen van landb. onderzoekingen der Rijkslandbouwproefstations*, X, 1909) suggest that the so-called "oat disease" recorded on the reclaimed land of the provinces of Groningen and Drent is to be attributed to the injurious influence exercised upon the soil by the vegetation and the manuring.

1. — Taking this and his other previous researches (*Id.*, XI, 1911) as a basis, the writer has undertaken a systematic study of the changes in the soil induced by individual cultivated plants and by the various chemical manures. In the first part of his researches, he studied potatoes, wheat and oats, which he grew in 16 paraffined zinc vessels, each containing 10 kg. (22 lbs.) of light sandy loam. The series consisted of 4 lots treated respectively with 3 gr. of nitrate of soda, 2.5 gr. of sulphate of ammonia, 1.5 gr. of nitrate of ammonia and nothing; three vessels of each lot were respectively planted with the above-named plants and the fourth was not planted. After the first crop was gathered, the soil was sifted, dried in the air and analysed. The second year, the soil was replaced in the vessels and cultivated in the same manner, but the amount of fertilizers given was halved, corresponding to about 450 lbs. of nitrate of soda per acre.

The analysis of the soil was limited to the determination of the rapidity of deposition of the fine clay; 100 gr. of each soil (dried) were taken, put in suspension in a cylinder and repeatedly stirred up; then the volume was made up to 500 cc., the contents of the vessels were again stirred and left for two days to settle; the cylinders were photographed by refracted light. The differences observed after the first year agreed with those of the second, but were less noticeable; the changes taking place after two years of the same treatment are consequently still greater. The results were as follows:

a) The most satisfactory deposition occurred in the non-cultivated soils of the four lots.

b) The deposition was least satisfactory in the cultivated pots of the nitrate of soda lot, intermediate in the nitrate of ammonia lot and that without nitrogen, and much more rapid and complete in the lot with sulphate of ammonia.

c) The effect of the three plants was in the following order: potatoes, wheat, oats.

Taking into consideration the lime content of the aqueous extract of the soil we have:

	mg. lime per 100 cc. 1910	1911
nitrate of soda		
potatoes	8.2	6.7
wheat	10.6	8.7
oats	12.3	8.5
control	13.0	11.8
sulphate of ammonia		
potatoes	13.1	12.4
wheat	13.6	14.4
oats	14.4	13.5
control	14.4	15.7
control		
potatoes	10.1	8.7
wheat	11.9	9.2
oats	12.4	8.9
control	11.0	10.6
nitrate of ammonia		
potatoes	9.6	10.1
wheat	10.9	11.1
oats	12.9	10.8
control	12.5	13.3

The agreement between the lime content of the aqueous extract of the soil and the facts quoted as to the deposition of the fine soil is evident, the latter being taken as the index of the structure of the respective soils. This important agreement is confirmed by the fact that, on equalizing the lime content of the various cylinders by means of the addition of chloride of lime, the differences in the manner of the deposition of the clay disappeared.

For the completion of these researches, the writer proposes to analyse the crops and determine the lixiviation action of the atmospheric precipitations.

2. — The above-mentioned researches of Sjollema and of the writer had indicated as the cause of the "oat disease" the unfavourable effect exercised on humous sands by the long-continued application of lime and manures containing lime, including basic slag, as well as of nitrate of soda. In these researches the writer has studied the alterations which may occur in the soil.

To this end, not having succeeded like the American investigators in separating out definite chemical bodies, he began with ordinary reclaimed soils which had not been limed; from these he separated the organic part *O* and also, by means of solution in soda and fractional precipitation with calcium chloride, two humic substances I and II; these three bodies contained respectively 35.31, 48.29 and 35.65 per cent. of organic matter; and 1.14, 12.77 and 2.56 per cent. of lime. Mixtures of these substances with alluvial sand, *Z*, were placed in 32 pots; the amount of sand was 20 kg. (44 lbs) or 13.4 kg. (29.5 lbs), according to whether only the substances I and II were added or whether O also was added; the amounts of I and II were 100 gr. and 600 gr. or multiples of these, and the amount of O was 3.4 kg. (7.5lbs.) or submultiples of this. In the years 1908, 1909, 1910 and 1911 oats were grown with the application, the first year, of basic slag, sulphate of potash and nitrate of soda and afterwards with monopotassium phosphate in place of the slag; the last year, the ground was specially treated with fertilizers containing manganese and with sulphate and nitrate of ammonia. The following results were observed:

a) II mixed with Z and with Z and O caused the "disease".

b) I caused the "disease" mixed with O only, even in the proportion of ½ per cent.

c) The diminution of the crop due to the "disease" is very evident.

d) Manganese sulphate, manganese hydroxide, and sulphate of ammonia have much curative action.

The soil sickness caused by chemical (alkaline) treatment alone appears to be due to a characteristic belonging to humic substances in general. In fact, besides having been recorded in other soils (sandy, in Holland and Holstein) this phenomenon can be artificially produced. If a mixture of sand and sugar humus is treated with lime or soda and nitrate of soda, this soil after some years becomes sick. The same thing occurs on treating pure sand to which a solution of pyrogallol is added; the latter substance has the property, belonging also to humic substances, of absorbing oxygen from the air in an alkaline medium.

Conclusions:

I. The injurious action of alkaline manuring upon sandy-humous soils, to which is attributed the oat disease, is due to the formation of certain unknown humic bodies, which are chiefly found in those portions of the organic matter which are insoluble in alkalis.

II. Owing to the use of chemical manures, the study of humic substances is especially important. It is therefore much to be wished that abnormal occurrences in the cultivation of humiferous soils should be studied from the chemical point of view. The study of the effects of chemical manures upon humic substances is also of great importance for agricultural bacteriology.

346 - **Efficiency of Soluble Manures in Dry Years.**

LÉONARDON, F. Efficacité des Engrais solubles en année sèche. Résultats obtenus dans les champs d'Expériences et de Démonstrations en Algerie et Tunisie en 1911-1912. — *Revue Agricole et Viticole de l'Afrique du Nord*, Nos. 49 and 50, pp. 151-155 and 180-186. Algiers, February 15 and 22, 1913.

The experiments wih mineral manures were made on the following crops: cereals (wheat, barley and oats), vines, tobacco, cotton, fruit trees and lucerne.

Some experiment fields have not yielded any results owing to the following causes:

a) The crops were not weighed by the experimenters, either through negligence or because the yields seemed too insignificant.

b) The yields were next to nothing owing to late sowing in badly prepared soil, to the unusual drought of the year and to the sirocco of the month of May.

c) Too tardy spreading of the nitrate of soda.

Among the experiments which gave results, the following are the most instructive.

Cereals: Results per acre.

1) *Hard wheat: Loam (Algiers).*

Plot	Manure		Yield per acre	Excess above control	Value at 12*s* 1*d* per cwt.			Manure			Net profit		
		lbs.	lbs.	lbs.	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*
1	Control	—	606	—	—			—			—		
2	Basic slag	446	856	250	1	7	0		11	3		15	8
3	Basic slag Nitrate of soda	416 89	1100	494	2	13	5	1	0	10	1	12	7
4	Basic slag Nitrate of soda	446 134	1213	606	3	5	5	1	5	8	1	19	9
5	Basic slag Nitrate of soda	446 178	1171	865	4	13	4	1	10	6	3	2	10

2) *Hard Wheat: Loam* (*Algiers*)

Plot	Manure		Yield per acre		Excess over control		Net profit		
			grain	straw	grain	straw			
		lbs	lbs.	lbs	lbs.	lbs.	£	s	d
1	Superphosphate. . .	267	455	1338	—	—		—	
2	Superphosphate. . Nitrate of soda. .	267 89	606	1516	151	178		7	8
3	Superphosphate. . . Nitrate of soda .	167 178	735	1605	280	267		13	4

3) *Hard Wheat* (*Native school at Ben-Chicao*).

Plot	Manure		Yield		Excess over control		Value of excess over control			Manure			Net profit		
			grain	straw	grain	straw									
		lbs.	lbs.	lbs.	lbs.	lbs.	£	s	d	£	s	d	£	s	d
1	Control	—	758	1160	—	—		—			—			—	
2	Basic slag	357	848	1427	89	268		11	7		10	3		1	4
3	Sulphate of potash .	223	803	1338	45	178		6	1	1	4	10		—	
4	Nitrate of soda .	223	892	1427	134	268		16	4	1	4	4		—	
5	Slag and nitrate . .	—	1248	1695	990	535	2	16	9	1	14	4	1	2	5
6	Slag and potash. .	—	1115	1427	357	268	2	0	5	1	13	1		7	4
7	Potash and nitrate .	—	1160	1784	401	625	2	7	10	2	6	10		1	0
8	Slag, potash, nitrate of soda	—	1338	2498	580	1338	3	12	2	2	17	1		15	1

4) *Barley, on calcareous or marly soil (Constantine); rainfall from November to the end of June 142 mm. (about 5 ½ inches).*

Plot	Manure		Price of manures per cwt.		Yield per acre		Net profit. Barley at 8s 1d per cwt.	
					grain	Excess over control no. 1		
		lbs.	s	d	lbs.	lbs.	s	d
1	Superphosphate . . . . Nitrate of soda	267 27	3 12	7½ 1	1 162	250	6	5
2	Superphosphate	267	—		1 102	170	3	[illegible]
3	Control No. 1.	—	—		932	—	—	
4	Superphosphate . . . . Cyanamide	267 89	11	8	923	0	—	
						over control no. 2		
4[1]	Superphosphate . . . . Cyanamide	267 89	—		825	85	nil	
5	Control No. 2.	—	—		740	—	—	
6	Superphosphate . . . . Oil cake	267 133	— 7	 3	714	—	—	

Vine: Results per acre.

1) *Carignan vine: flat gravelly soil (Algiers).*

Plot	Manure		Yield	Excess over control	Value at 7s 3d per cwt.			Degrees of the must	Net profit		
		lbs.	lbs.	lbs.	£	s	d		£	s	d
1	Superphosphate. . . .	357	10 955	—	—			11.5°	—		
2	Superphosphate. . . . Nitrate of soda . . .	357 178	14 078	3 122	10	2	2	—	9	3	7
3	Superphosphate. . . . Sulphate of potash . .	357 178	12 044	1 142	3	10	7	12.0°	2	13	3
4	Superphosphate. . . . Sulphate of potash . . Nitrate of soda . . .	357 178 178	14 452	2 560	11	6	10	12.9°	9	10	11

2) *Loam poor in lime (Algiers).*

Plot	Manure	Yield of grapes	Excess over control		Value at 10.81*d* per gal.			Manure and carriage			Net profit		
			grapes	wine									
		lbs.	lbs.	gals.	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*
1	Control	17 892	—	—		—			—			—	
2	Organic manure. 892 lbs. per acre, at £5 per ton. .	18 624	731	56.5	2	11	4	2	0	1		11	3
3	Basic slag: 446 lbs. at £2 16*s* 5*d* per ton. Nitrate of soda: £12 1*s* 11*d* per t.	22 504	4 612	356.4	16	0	11	1	10	5	14	10	5

3) *Carignan, Morastel and Alicante vines: loam on clay subsoil (Medeah).*

Plot	Manure	Yield of grapes	Degree of must	Excess over control		Value at 1*s* 1.8*d* per gallon			Manure			Net profit		
				grapes	wine									
	lbs.	lbs.		lbs.	gals.	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*
1	Control . . . . . —	8 654	14°	—	—		—			—			—	
2	Basic slag . . . . 357 Sulphate of potash 134	9 992	—	1 338	986	5	18	1	1	3	9	4	14	4
3	Sulphate of potash 134 Nitrate of soda. . 134	10 706	—	2 052	1 650	9	10	0	1	7	11	8	2	1
4	Basic slag . . . . 357 Nitrate of soda. . 134	10 884	—	2 230	1 784	10	5	4	1	4	8	9	0	8
5	Basic slag . . . . 357 Potash . . . . . 134 Nitrate of soda. . 134	11 598	14.5°	2 944	2 319	13	7	0	1	18	2	11	8	10

4) *Carignan vine, loam, poor in phosphoric acid and in calcareous compounds, irrigated (Philippeville).*

Plot	Manure per acre	Yield of grapes	Excess over control		Value at 1s 1.01d per gallon			Manure at 12s 1d per cwt.			Net profit		
			grapes	wine									
		lbs.	lbs	gals	£	s	d	£	s	d	£	s	d
1	Control	9 403	—	—		—			—			—	
2	254 lbs nitrate of soda	11 116	1 713	138	6	19	3	1	7	6	5	11	9
3	379 lbs. nitrate	10 295	892	71	3	11	10	2	0	11	1	10	11

Forage Plants: Results per acre.

Five-years-old lucerne; loams, insufficient irrigation (Algiers).

Plot	Manure per acre	Dry hay (total of 5 cuts)	Excess over control	Value of excess at 4s per cwt			Net profit		
		lbs.	lbs.	£	s	d	£	s	d
1	Control	8 341	—		—			—	
2	1070 lbs. superphosphate .	10 036	1 695	3	1	0	1	14	0
3	1070 lbs. basic slag . . .	10 616	2 275	4	1	10	2	14	10

From the above experiments the following conclusions may be drawn:

I. — Mineral manures are more efficient than organic manures. Among the nitrogenous manures used (organic manures, oil-cakes, cyanamide, nitrate of soda) nitrate of soda yielded the best results. In most cases the other nitrogenous manures did not give any excess over the control plot.

II. — The manures must be ploughed in early, excepting the nitrate of soda which should be given as a top-dressing: in February in the vineyards, in December one-third and in February or March two-thirds on cereals. For other crops the nitrate of soda is to be ploughed in with the phosphatic and potash manures.

III. — There is a minimum of moisture below which manures act but little, and give no profits. According to M. Chouchak, in Crimea if the rainfall is less than 200 mm. (8 inches) from November to the end of June and on soils containing less than 15 per cent. of moisture, manures increase the yield by very little or nothing.

IV. — Phosphatic manures are insufficient in poor soils or in those only moderately rich in nitrogen. They must be completed by nitrate of soda or by sulphate of potash.

347 - Fertilizers and Manures in Canada.

(1) EMSLIE, L. E. The Use of Commercial Fertilizers in Canada. — *Communicated by* T. K. DOHERTY, *Commissioner of the International Institute of Agriculture in Canada.*
(2) NUNNICK, F. C. Agricultural Survey, 1911. — *Commission of Conservation, Canada, Report of the Third Annual Meeting, held at Ottawa, January 6th 1912*, pp. 106-129 + tables. Montreal.

(1) *The use of fertilizers in Canada.* — The use of commercial fertilizers in Canada has scarcely passed the initial stage, although in the Maritime Provinces, more especially in the fruit and potato-growing districts, fertilizers have been popular for years. Ontario and Quebec have, during the past five years, been giving the subject more attention and may be expected to rapidly increase their consumption from this stage. British Columbia quickly learned the value of fertilizers and takes high rank as a consumer. This year a Victoria firm shipped a carload of fertilizer to Dawson City in the Yukon. The Provinces of the middle-west will not be heavy consumers for many years to come, although the use of fertilizers there has commenced, chiefly amongst market-gardeners and potato-growers, but they are also being used to a small extent by grain-growers. The prevailing high freight rates necessarily add greatly to the cost of the fertilizer, and this aggravates the difficulties of pioneer work. In the younger provinces of Alberta and Saskatchewan, the interest in the fertilizer question seems greater than in Manitoba. This may be explained by the fact that within recent years there has been a very large emigration of United States and European farmers to Alberta and Saskatchewan, men who were already familiar with the use of fertilizers.

The following table shows the principal fertilizer materials imported into Canada during the years ending June 30th, 1904, and February 29th, 1912, respectively, and a comparison of the two years indicates the increase which has taken place in the intervening period:

	12 Months ending June 30th, 1904		12 Months ending Feb. 29th, 1912	
	lbs.	$	lbs.	$
Fertilizers (manufactured)	—	134 063	—	413 905
» (unmanufactured) . . .	—	19 155	—	3 151
Muriate and sulphate of potash .	1 836 315	33 740	6 840 138	125 840
Kainit and other potash salts . .	726 917	5 868	985 750	9 252
Acid phosphate	285 707	15 248	1 348 422	61 554
Phosphate rock	—	8 000	—	43 774
Blast furnace slag	—	6 806	—	119 141
Sulphate of ammonia	186 064	5 485	540 863	16 156
Nitrate of soda	12 849 769	258 578	58 711 867	873 766
Nitrate of potash	1 978 972	86 308	2 273 437	107 313

In the case of "Manufactured Fertilizers" and a few other items it has been impossible to get the quantities, the value only being given. "Unmanufactured" fertilizers represent those materials which could not be properly identified, and the decrease in the amount of these will a). — *Area Surveyed.*

	Nova Scotia	Prince Edward Island	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
No. of farms . . .	100	100	100	200	300	100	87	85	140
Total acreage . . .	16 893	10 992	13 991	30 552	33 340	39 999	35 303	22 713	62 428
Field crop acreage .	5 958	8 220	6 836	19 459	24 634	28 045	24 616	16 222	14 761
Percentage of total area	35	74	49	64	74	70	70	71	24
Grain acreage . . .	1 072	2 508	1 750	5 640	10 917	26 003	24 149	12 855	3 652
Percentage of field crop area	18	30	25	34	44	93	98	78	25
Hoe crop acreage. .	277	516	249	806	3 126	205	—	89	1 263
Percentage of field crop area	5	6	3	4	12	0.02	less than ½	0.54	9
Hay and pasture acreage	4 609	5 196	4 837	13 014	10 596	1 757	—	—	9 846
Percentage of field crop area	77	62	71	66	43	6	1.8	21	67

b) *Use of Farm Manures.*

(Figures as percentages).

	Nova Scotia	Prince Edward Island	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
No. using farm manures	100	100	100	100	100	most farmers	78 % use some	70	88
No. giving no care to manure . . .	22	64	44	76	44	77	the majority	—	55
Very little care. .	11	—	15	—	3	—	—	—	—
Fair care	59	34	29	20	25	14	10	5	18
Good care	8	—	—	4	15	—	11	—	—
No. burning the straw	—	—	—	—	—	16 4 % burn some	—	—	—
No. burning the manure	—	—	—	—	—	—	22	many	—

indicate better classification facilities in recent years. "Acid Phosphate" (non-medicinal) would seem to include a large proportion not used for fertilizer purposes, since the value given is much in excess of the price of this material as a fertilizer. "Nitrate of Soda" is at present the most popular form of nitrogenous fertilizer, but the bulk of this material imported is used for manufacturing purposes, and it is yet impossible to estimate even approximately the amount used for fertilizer purposes. "Nitrate of Potash" is also almost entirely used for industrial purposes, its use as a fertilizer being very limited.

No figures are available to show the production of fertilizers in Canada itself, but most of the slaughter-house tankage and bones, formerly exported, is now, by the addition of potash, being converted into mixed fertilizer for home consumption.

The importation of other fertilizer materials gives, however, a sufficient indication of Canada's increasing fertilizer consumption.

(2) *The use of farmyard manure in Canada.* — From the summary of the agricultural conditions found by the Commission of Conservation of Canada in the localities where the agricultural survey was conducted in 1911 the data on the use of farmyard manure given on the previous page are extracted.

348 - A Potash Salts Deposit in the United States of America.

DOLBEAR, C. E. The Searles Lake Potash Deposit. — *The Engineering and Mining Journal*, Vol. 95, No. 5, pp. 259-261 + fig. New York, February 1913.

Many potash salts deposits have been alleged of late in the United States, but apparently the best prospects are in the Searles Lake. This is a floor of an ancient lake which lies between the State and Argus Ranges just south of the boundary line between Inyo and San Bernardino Counties in California. The deposit is on and under the bottom of the lake, the area of which is about 40 000 acres. Potassium was not looked for at first, but sodium carbonate in such condition that it could be readily reduced to soda ash.

Borings were made over the salt-bed area at intervals of from one-half mile to one mile and determined the following facts: that the average thickness of the soluble-salt bed is a little over 70 ft.; that the first 23 ft is mostly sodium chloride with a greater or less amount of impurity in the form of sodium sulphate and small amounts of sodium carbonate and borax; that the underlying 47 ft. is composed of strata of mixed sodium chloride, sulphate, carbonate, bicarbonate and borax, together with potassium chloride. All of the deposit is coarsely crystalline in structure, much honeycombed, and the interstices are filled with a brine saturated with all of the salts of the deposit except sodium bicarbonate.

This brine has a specific gravity of 1.3. The analyses of the brine show remarkable regularity of content throughout the whole of the underlying beds; that is below the first 23 ft., 100 lbs. of this brine carries, on the average, dissolved salts in the following amounts :

	lbs.
sodium chloride	16.77
» sulphate	5.46
» carbonate	4.61
» biborate (anhydrous)	1.32
potassium chloride	4.49
Total	32.65

The salt obtained by evaporating to dryness and calcining the product to expel combined water, analyses :

	per cent.
sodium chloride	51.3
» sulphate	16.7
» carbonate	14.1
» biborate	4.0
potassium chloride	13.6

The brine constitutes approximately 18 % of the total weight of the mass of the deposit. The brine carrying the more valuable salts occurs below the sodium-chloride bed. The underlying bed averaging approximately 47 ft. thick, and the area explored being 12 sq. miles, the total weight of the underlying bed is then approximately 800 000 000 tons, and 18 % of this is 144 000 000 tons. As the brine carries an average of 4.49 % potassium chloride, the tonnage of that salt in solution is then 6 465 600 tons. The brine also carries 1 900 000 tons of anhydrous borax, equivalent to 3 400 000 tons of commercial borax ; further the brine carries 6 630 000 tons of sodium carbonate.

The solids of the deposit below the sodium-chloride bed have the following average analysis :

	per cent.
insoluble (sand, etc.)	1.44
sodium chloride	45.90
» sulphate (anhydrous)	22.80
» carbonate (ditto)	16.57
» bicarbonate	6.50
» biborate (anhydrous)	2.32
potassium chloride	3.64

The total amounts of the valuable salts in solid form are then :

	tons
sodium carbonate	108 500 000
» bicarbonate	42 700 000
» biborate (anhydrous)*	15 200 000
potassium chloride	23 900 000

(*) equivalent to 27 300 000 tons of commercial borax.

That the brine is free to flow through the solids is shown by boring a well into the material. A 6-in. hole bored through the deposit and cased through the sodium - chloride bed will yield not less than 3 000 tons of brine per day.

At present the evaporation-power of the air in July and August is about 1 in. per day of saturated brine; the actual evaporation is probably much less, as the surface is only kept damp by capillary action. In any case, the pumping of the brine would check this movement, and any water flowing into the bed would dissolve out more of the salts and so keep up the supply of brine.

The brine alone is alleged to contain sufficient potassium chloride to supply the United States with that salt at the present rate of consumption for 16 years, supposing there to be no renewal of the brine. With a renewal as above suggested the deposit is stated capable of supplying potassium chloride at the present rate of consumption for at least 70 years.

349 - The Use of the Phonolite of the Bohemian Mittel Gebirge as a Fertilizer.

SEEMANN, F. Ueber die Verwendung der Phonolite des bohmischen Mittelgebirges zu Düngerzwecken. — *Landwirtschaftliche Jahrbücher*, Vol. XIII, Part 4, pp. 509-520. Berlin, 1913.

Since 1908, the West German Railway Co. (West deutschen Eisenbahn-gesellschaft) and, more recently, the Rhenish Potassium Silicate Works (Rheinischer Kalisilikatwerken) the Kempenich Phonolite Works of the Graf Gleichen Mining Co. (Kempenicher Phonolitwerken der Gewerkschaft Graf Gleichen), and the Leuchtenberg Mining Co. (Gewerkschaft Leuchtenberg) have put on the market under the names of "phonolite meal", "silicate of potash", "eifelite" and "vulcophonolite" a potash manure made from crushed rocks from the Eifel. It appears that, in spite of the negative results obtained in many Agricultural Stations and Institutes, the use of this new fertilizer is increasing. Thus, phonolite from the Bohemian Mittelgebirge is also placed on the market.

The writer, basing his opinion on already existing analytical and mineralogical data, comes to the conclusion that the phonolite of the Mittelgebirge of Bohemia is, from its chemical and mineralogical composition, much less suitable as a fertilizer than the leucitophyre of the Eifel. For while the potassic constituent of the latter is leucite, which is very soluble and particularly rich in potash, that of the former is sanidine, a comparatively insoluble substance much poorer in potash. Leucitophyre possesses a total potash content of 9 or 10 per cent., and a soluble potash content of about 3.5 per cent., while the total amount of potash usually present in the Bohemian phonolite is usually only 4 to 6 per cent., rarely amounting to 7 per cent., and that of soluble potash never exceeds 2 per cent. and is as a rule only 1 per cent. The addition of calcareous salts or humiferons matter to increase the solubility of the potash is less satisfactory in the case of the phonolite than in that of the leucitophyre.

The writer, in conclusion, warns his readers that more care is required in obtaining and applying phonolite meal than is needed in the case of Eifel leucitophyre meal.

The deposits in question are those of natrolitic phonolite of Marienberg and Steinberg near Aussig, and the tephritie phonolite of Ziegenberg near Gross-priesen.

350 - **Catalylic Radio-active Manures**

MALPEAUX, L. Les engrais radioactifs. — *La Vie Agricole et Rurale*, Year II. No. pp. 242-243. Paris, February 1913.

Manurial trials to test the efficiency of catalytic radio-active (1) manures were carried out at the Agricultural School of the Pas de Calais. Some preliminary pot experiments with oats and crimson clover (*Trifolium incarnatum*) gave positive beneficial results whenever the radio-active manure was employed. In the field trials the radio-active manure was mixed with other common fertilizers, forming 5 per cent. of the bulk, and the application per acre varied from 22 to 44 lbs.

Some of the results obtained were as follows:

	With radio-active manure		Without radio-active manure	
Oats	87	bushels p. acre	76	bushels p. acre
Mangels . . .	22.2	tons „ „	21.5	tons „ „
Sugar beets. .	8.8	„ „ „	7.7	„ „ „

In the case given above the oat crop was increased 15 per cent., but on neighbouring plots, where the dressing of super was replaced by slag, the increase was nil. The mangels and sugar beets both gave increased yields, and on analysis no difference in composition could be detected between those grown on the check plots and those grown on the plots receiving the radio-active manure, but the sugar beets on the latter plots matured earlier.

351 - **The Intensity of Light and its Effects on Vegetable Assimilation.**

MÜNTZ, M. A. La luminosité et l'assimilation végétale. — *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 5, pp. 368-370. Paris, February 1913.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

In laboratory experiments on carbon assimilation it has been demonstrated that assimilation is more active in direct sunshine than in diffuse daylight, and, by analogy, it has been assumed that the same held good for vegetation under natural conditions. Of course under field conditions, the plants exposed to diffused daylight are also exposed to far more humid conditions generally, and the larger supply of water more than counteracts the effect of the greater light intensity. But given that the water supply was always sufficient, what is the effect on vegetation of light of high intensity? In order to test this point a crop of lucerne was set aside at Meudon during the three summers 1910, 1911 and 1912. Part of it was given no special treatment, while the other received 40 litres of water per square metre every 7 days, so that the soil never dried out. The yields of dry matter per square metre per day were as follows:

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(1) See No. 781, *B.* May 1912. (*Ed.*).

	Under natural conditions	Watered —
1910	5.24 grams	10 56 grams
1911	1.24 »	7.00 »
1912	3.12 »	9 42 »

During the years 1910 and 1912 the sky was overcast during the greater part of the summer, whilst 1911 was a season of bright sunshine and drought. The yields under natural conditions show the relative importance of light intensity and water supply in plant growth, but even when the latter factor is eliminated by artificial watering, the more intense light appears to have an unfavourable effect on the production of vegetable matter.

This apparently contradictory result obtained when a laboratory experiment is extended to field conditions arises from the fact that in the laboratory the plants are necessarily kept in an artificial atmosphere relatively richer in carbon dioxide in order that it should be possible to detct variations in the percentage of that gas caused by the process of carbon fixation; whilst in the natural atmosphere the amount of carbon dioxide present is so small that the solar radiations, be they diffused or direct, are always sufficient to make the best use of the carbon dioxide. In other words, carbon assimilation is limited by the amount of carbon dioxide in the air and not by the intensity of the solar rays.

352 - The Effect of Weak Acids on Germination.

PROMSY, G. Role des acides dans la germination (a note presented by M. Gaston Bonnier). — *Bulletin des Séances de la Société Nationale d'Agriculture*, Year 1912, No. 10, pp. 916-922. Paris, 1912.

Citric, malic, tartaric, acetic, hydrochloric and sulphuric acids were employed, in solutions varying from 0.05 to 0.5 %, and seeds with both succulent and dry pericarps. Seeds with succulent pericarps, such as tomatoes, would under natural circumstances germinate in an acid medium, and these all profited to the largest extent by the external application of acid during germination. Seeds of non-acidic fruits were sometimes assisted and sometimes hindered in germination by an acidic medium, the effect being apparently due to the action, favourable or otherwise, of the acid on the diastatic activity of the seed.

The favourable action of the acid was obtained not only by germinating the seed in an acidic medium, but also by a preliminary soaking of the seed in acid and subsequent sowing in a neutral medium; the small quantity of acid absorbed during the steeping was sufficient to modify the vegetative growth in a remarkable manner. If the seed was subsequently sown in an alkaline medium, the beneficial effect of the acid was diminished, but still perceptible ; certain nutritive materials also had a neutralizing effect.

The absorption of acid was greatest during the first stages of germination, varied directly with the concentration of the solution, and was apparently independent of the action of light. The absorbed acid must have been rapidly transformed after absorption, as the internal acidity of the seedlings was not increased, a further proof of its rapid decomposition being indicated by an increased respiration of the seedlings. While light did not appear essential to the decomposition of the acid, it produced a favourable influence on its assimilation and utilization.

The absorbed acids not only modified the metabolism of the seedlings, but also their morphology; on the one hand they retarded the sclerification of the fibrous tissue and the lignification of the wood, and on the other hand increased the volume of the central cylinder and the growth of the conductive tissue.

PLANT
BREEDIN

353 - The Selection of Hungarian Wheat.

GRABNER, ÉMILE (Director of the Royal Hungarian Station for Plant Breeding at Magyaróvár). A magyar buza nemesitése. — *Köztelek*, Year 23, Nos. 11 and 15, pp. 330-333 and 407-408. Budapest, February 8 and 15, 1913.

The question of the systematic improvement of Hungarian wheat has for some years become of increasing importance, for though the native cereal is suitable to the climate, as it ripens early and resists the winter cold, it does not supply the needs of the country, for its yield is poor and it not only lodges much, but is greatly predisposed to the attacks of rust.

Numerous and repeated experiments made with the acclimatized varieties, Hybrid Treasure and Prolific, have shown that these cannot withstand very severe cold ; thus, in spite of their superior quality, they are useless as substitutes for Hungarian wheat. Now, if by means of rigorous selection the average wheat yield throughout Hungary could be increased by 2 or 3 bushels per acre (at present, it does not exceed 15 ½ to 17 bushel per acre) the 9 162 150 acres under wheat would give an extra yield of 18 to 27 million bushels, representing an increase in the revenue of the country of £4 000 000 to £6 000 000, reckoning the price at only 36*s* 6*d* per quarter.

In 1905, the Royal Hungarian Institute for Plant Selection at Magyaróvár began its first selection experiments in the different districts of the country, and then persuaded the owners of three large estates, Árpádhalom, Bankut and Csorvás to carry out experiments on larger areas. As Hungarian wheat, like other unimproved varieties, is not uniform, but is a mixture of more or less different types, it was necessary to adopt pedigree breeding. The task consisted, on the one hand of selecting plants with different characteristics from the experiment fields, and on the other of only reproducing selected types superior to the parent variety. The choice of select types was made with a view to securing early maturing varieties with a heavy yield of grain, strong-strawed and resistant to frost. The pedigree method proved very successful, for even during the experiments of the first year the plants growing on the plot of the parent plant were of a uniform type, while those from other plots showed different characteristics. All the parent stems were numbered and registered.

Last year the Arpádhalom estate had reached No. 615 in selections of parent ears and had 14 selected types obtained from the first experiments only (begun in 1905); these were followed later by numerous other new types.

The following figures give the results obtained in 1912 from pedigree Arpádhalom wheat:

Name of the estate	Number of selected type	Average yield of grain per acre: Selected Wheat	Parent Variety	Excess over the parent Variety
		lbs.	lbs.	lbs.
Árpádhalom	178	1 649	1 546	103
»	217	1 941		395
»	219	2 038		492
»	239	2 281		735
»	246	1 860		314
»	253	2 097		551
»	266	2 196		650
Zoltánter	16	1 841	1 582	259
Szandrey	19	1 910	1 477	433
»	117	1 666		189
Lajosszénás	17	2 025	1 407	618
Peresznye	1	2 561	1 633	928
»	16	2 517		884
»	19	2 637		1 004
»	178	2 304		671

Thus the yield of the pedigree wheat is much larger than that of the parent variety and the former grows as well in other districts as in those where the experiments were made, for selected Arpádhalon wheat produced a magnificent crop at Peresznye.

Finally, in order to fix the characters of the selected types, the Institute began hybridization experiments in 1909. Thus for example, an early variety very susceptible to rust and with a small yield, was crossed with a late, more productive, and rust-resistant variety, or one of fine quality with weak straw was crossed with a commoner type with stronger straw, etc. At the Institute experimental ground 1886 plots were sown with seed from hybrids obtained in the preceding years ; further, the crosses of last year furnished 1212 parent plants.

The experiments are being continued with every possible combination, and it is hoped that a predigree Hungarian variety of perfect quality will be produced.

354 - Comparisons of Yield between Hybrids and Selections in Oats.

LOVE, H. H. in *The American Breeder's Magazine*. Vol. III, No 4, pp. 289-292. Washington, 1912.

On the data obtained in the plant breeding work at the Cornell Experiment Station during the past 5 years, the yielding power of different strains of oats obtained on the one hand by hybridisation, and on the other by selection is compared. The trials were all made in single rows, 1 rod in length, repeated a number of times, as this method gave more correct results than one large plot repeated only once.

The best strains from both sources were isolated in 1907 and 1908, and then tested during the 3 years 1909-11 ; they produced the following average yields :

	10 best hybrids — bushels per acre (1)	10 best selections — bushels per acre
	51.7	47.3
	51.8	49.4
	52.1	49.5
	52.4	51.1
	53.1	51.1
	53.6	54.5
	54.0	54.6
	54.3	57.3
	55.0	57.3
	62.1	58.6
Average	54.0	58.1

In 1910 and 1911 a number of well-known commercial varieties were included in the trials and comparative figures for the two-year period are as follows :

Hybrids	59.0	bushels per acre.
Selections	58.1	» »
Varieties	50.8	» »

In both these cases, and in all the results taken as a whole, the hybrids gave slightly better yields than the selections, though the differences are small and vary from year to year. The data also furnish considerable evidence on the value of certain plants in hybridisation, 9 out of 10 of the best hybrids having a common parent.

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(1) The standard bushel of oats in the United States weighs 32 lbs. *(Ed.)*

355 – A Variety of Maize with Silks maturing before the Tassels.

COLLINS, G. N. — *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 107, pp. 1-11. Washington, February 1912.

In the varieties of maize cultivated in the United States the anthers usually open before the silks (stigmas) appear on the same plant, and pollen is still falling when the silks are in a receptive condition. Except where high and constant winds prevail at flowering time, this results in a large proportion of self-pollinated seed. In maize, self-pollination so reduces the vigour of the plants that any means by which it can be avoided or reduced is worthy of consideration, and the best means of so doing is to produce a protogynous plant, as in that case, should cross-pollination fail, there is still the chance of self-fertilization.

Many attempts have been made to develop this habit in some of the improved varieties, but so far without success. In January 1912 two ears of red pop corn were purchased at Granada, Spain, by a member of the Staff of the Bureau of Plant Industry and when planted in Maryland the following season produced plants almost every one of which was protogynous. The ears of this variety are so small that it will probably be of no economic importance, except perhaps as a pop corn, and moreover, the subsequent behaviour of a variety cannot be inferred by its behaviour the first year; but it seems certain that the protogynous tendency exists in a marked degree, and the strain may prove valuable as breeding material. Only a small quantity of seed is on hand, but a few grains can be supplied to those wishing to make a study of this variation and to assist in determining its economic importance.

CEREAL AND PULSE CROPS

356 – Investigation of the Relation between Anatomical Structure and Physiological Characters in Oats.

JAHUSHKINE, O. W. and VAVILOV, N. *Anatomiichaskoe* izsledowanie nieskolkich rajs ovsa v sviaji s voprosoni o sotnoschenii phisiologuitcheskioh svolstv s anatomicheskinii koeffizientami — *Jurnal Opsinoi Agronomii* (Russisches Journal für Experimentelle Landwirtschaft), Year XII, Part 6, pp. 830-861 (855-861). St. Petersburg, 1912.

Of late years, the question of the importance of the size of leaf cells and particularly the size of stomata in distinguishing the different varieties of cereals and other cultivated plants has been much brought forward by the works of Prof. V. Kolkunov of Kiev. (1). According to the latter, there is an intimate connection between the anatomical structure of plants (the size of the stomata) and the intensity of different physiological functions, such as the assimilation of carbonic acid, transpiration energy, osmotic pressure of the cell sap, and indirectly in the case of cereals, the duration of the vegetative period. In other words: Prof. Kolkunov shows by his experiments that the degree of drought resistance, early or late maturity, winter resistance, etc., depends upon the anatomical peculiarities of the plant and especially on the size of its stomata.

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(1) See No. 1621, *B.* Dec. 1912.

The article in question gives an anatomical examination of some cultivated varieties of oats which show various morphological and physiological characters in order to throw light on the magnitude of the differences which exist in oats in this respect. It was also interesting to compare the several anatomical differences with the physiological characteristics of the different varieties, especially as oats were hardly touched on in Prof. Kolkunov's investigations.

As material for this purpose pure lines of oats were taken, these being obtained by individual selection from various mixed German and West Russian varieties. The lines chosen for the experiment were sown in the spring of 1911 and 1913 in plots on a levelled piece of land belonging to the Moscow Agricultural Institute, each plant being given 14 sq. in. standing room.

The leaves for measuring were gathered from definite nodes of the main culms from the middle of the plots as soon as the leaves ceased growing. The portions of the leaves at two-thirds of the length (measuring from the base) were selected for measurement. The stomata on the upper surface near the midrib were measured. To obtain the average size of the openings of the stomata, not less than 1 000 measurements (on 50 leaves) were taken for each variety. In addition to the length of the stomata, their number in the field of the microscope was also reckoned. (Eyepiece 4, Objective 4, Reichart System).

All the 17 varieties of oats investigated belonged to the group with covered grains and with the branches of the panicle spreading in all directions : ***Avena sativa* L.**

As there is no uniform system for the classification of cultivated oats, the writer gives a short morphological description of the varieties he investigated.

In the large table the results of the investigations of 1911 and 1912 are given. From the first column of this it is seen, as would *a priori* have been supposed, that the size of the stomata can in the case of oats, as in that of other cereals, be taken as a variety characteristic.

In the present case, where 17 varieties of oats were dealt with, two groups can be distinguished by the size of the stomata :

I. Large-celled group:
A-4113 Mesdag, A-321 Hudan, C-311 Brie
Average length of aperture:
for the top leaf, 1911 0.063 mm
» » third 1912 0.0735 »
II. Small-celled group: the other 14 varieties.
Average length of aperture:
for the top leaf, 1911 0 054 mm.
» » » 1912 0.067 »

The inheritance of differences in the size of the stomata is proved by the fact that variations occurred in the same direction for two consecutive years in both the experimental and the control plots.

TABLE I. — *Results of the Investigation*

Variety	Leaves of 1st node (reckoning from above) in 1911			Leaves of 2nd node (from above) in 1911			Leaves of 3rd node (from above) in 1911		
	Length of apertures of stomata µ	Number of stomata in field of microscope	Area of leaf sq. cm.	Length of apertures of stomata µ	Number of stomata in field of microscope	Area of leaf sq. cm.	Length of apertures of stomata µ	Number of stomata in field of microscope	Area of leaf sq. cm.
C-311: Brie, from Vilmorin, 1904 (1)	62.7	65					68.0	40	5.9
	64.7	60	8.0	—	—	—			
A-315: Canadian » » . .	56.1	56							
	55.7	55	7.8	—	—	—	64.0	34	7.0
A-317: Australian » » . .	54.5	61	14.1	53.1	60	—	66.0	32	10.5
A-321: Hudan » » . .	63.4	55							
	58.9	62	8.5	—	—	—	69.1	38	5.2
A-324: Probsteier » » . .	54.4	65		60.0	49				
	52.6	70	11.5	59.6	49	15.7	66.2	35	6.2
B-326: Swedish » » . .	53.5	64							
	54.5	64	11.7	—	—	—	64.8	33	6.1
A-351: Duppauer, from Breslau Exp. Field, 1901	52.4	71							
	51.8	70	10.6	—	—	—	65.0	36	4.7
A-359: Leutewitzer, from Breslau Exp. Field, 1901	55.6	65							
	53.9	64	10.5	56.5	56	—	65.8	35	7.7
A-368: Heine's Ertragreichster, from Breslau Exp. Field, 1902	55.5	62							
	53.5	67	11.8	57.0	51	19.4	66.2	32	7.4
A-377: Danish, from Exp. Sta. at Hoinow (Polotsk) 1902	54.5	61							
	53.5	66	11.8	—	—	—	—	—	—
A-396: Heine's Ertragreichster, from Exp. Sta. at Hoinow (Polotsk), 1902	56.1	57							
	54.9	63	11.6	57.3	53	—	—	—	—
B-4100: Duppauer, from Exp. Sta. at Hoinow (Polotsk), 1902	50.3	66							
	53.6	61	9.7	—	—	—	62.5	36	8.9
A-4030: Newmarket, from Exp. Farm of Wissokolitovskoy (Grodno), 1903	56.4	60		59.8	50				
	55.3	64	9.8	58.0	50	15.1	64.0	36	8.9
A-4035: Ligovo, from Livland, 1903	54.9	67		58.0	50				
	54.8	66	9.8	57.7	54	18.2	—	—	—
A-4051: Swedish selected.	56.9	59							
	555	61	9.5	—	—	—	—	—	—
A-4071: from Kirsch (Germany), 1906	55.2	53							
	54.7	55	12.2	58.5	47	17.9	61.1	36	5.6
A-4113: Mesdago from Haagen Schmidt, 1908	64.1	57	12.4	62.0	50				
	—			65.0	50	—	73.5	31	10.3

(1) Two sets of figures for one variety refer to two different plots.

of Varieties of Oats (1911 *and* 1912).

Vegetation-period in days			Tillering		Total yield (grain and straw) per plant			Yield of grain per plant			1000 grain weight	Attack of rust (*Puccinia coronifera* Kleb.)
1911	1912	Average	1911	Average 1911	1911	Average 1911	1912	1911	Average 1911	1912	1911	
Days					gr.			gr			gr.	
122	118	120	2.8 3.0 1 6	2.9	6.8 9.7 6.4	8.2	6.6 8.4	2.7 3.4 2.8	3.0	1.9 2.6	28.0	moderate
108	105	107	1.5 1.9	1.6	5.8 5.8	6.1	7.3	2.8 2.8	2.8	3.4	38.5	severe
102	97	100	2.1 3.4	2.0	6.6 7.5	6.2	5.8	3.2 3.0	3.0	2.1	35.4	»
122	119	121	3.1 2.3	3.3	7.2 7.4	7.4	— 9.7	2.8 3.8	2.9	— 3.0	26.6	moderate
108	107	108	2.0 2.0	2.2	6.0 5.4	6.7	9.2	2.9 2.5	3.4	3.2	35.9	severe
109	105	107	1.7 1.9	1.9	6.6 7.5	6.0	5.4	3.1 3.6	2.8	2.2	37.8	»
109	105	107	1.8 1.9	1.9	6.5 7.9	7.0	5.9	2.7 3.4	3.2	2.5	33.5	»
108	107	108	1.6 1.5	1.8	6.5 7.2	7.2	6.9 7.2	2.9 3.2	3.2	2.6 2.6	37.2	»
109	107	108	2.0 1.7	1.8	7.9 5.8	7.6	7.8	3.6 2.3	3.4	3.0	33.8	»
108	112	110	2.1 1.4	1.9	4.2 7.0	5.0	3.8	1.7 3.1	2.0	1.7	36.0	
108	105	107	1.4 1.6	1.4	6.0 6.0	6.5	—	3.0 2.9	3.1	—	33.9	»
110	105	108	1.8 1.9	1.7	6.6 5.6	6.3	3.8	3.2 2.6	3.1	1.7 2.8	37.2	»
110	105	108	1.9 1.9	1.9	6.7 5.5	6.2	8.5	3.1 2.8	2.9	3.0	40.3	»
112	105	109	2.0 2.2	2.0	6.9 7.3	6.2	5.2	3.0 3.0	2.9	2.1	38.5	»
114	107	111	2.6 2.0	2.4	7.8 7.0	7.6	3.1	3.6 2.9	3.3	1.5	40.2	»
114	112	113	2.0 2.6	2.0	7.8 6.7	7.7	4.6 5.6	3.4 2.9	3.2	1.7 1.8	39.7	»
98	94	96	2.4	2.5	6.2	6.5	5.2	2.8	2.9	1.6	30.8	»

According to the investigations of W. Zalensky and W. Kolkunov, as well as to the present observations on oats, there is a certain correlation between the size of the guard-cells and that of the aperture. As regards the number of the stomata, this is, according to Prof. Kolkunov, "a function of the length of the stomata," but this parallelism did not come out in the investigations of the writers on oats here desribed. Thus, the large-celled lines C—311 and C—321 in 1911 has a relatively large number of stomata (38 and 40 in leaves of the third node from below), while A—4113 in the same year had a smaller number (31) in the corresponding row of leaves. Further, there is no rule in the case of the second group of oats (those with small stomata).

The oats investigated show no correlation between the linear size of the stomata and the leaf area. Thus the large-celled C—311 and C—321 have the narrowest leaves, while the equally large-celled A—4113 has quite large leaves, well-developed as regards length and width. On the other hand, the Australian oat, A—317, a typical representative of the second small-celled group, shows a luxuriant leaf development. This has the largest leaf area.

With regard to the anatomical characteristics of the oats, it was found that the results confirmed W. Zalensky's law respecting the division of the stomata according to number and length in the different rows, viz. "the higher the insertion of the leaf, or the further the latter is situated from the root system, the more stomata it has on the same area in comparison to those of a leaf which is placed lower down ; but on the other hand, the size of the stomata diminishes with the distance from the root-system."

As in wheat, so in oats, the number of stomata on the upper surface of the leaf is larger than that on the lower; this is contrary to the general opinion on the subject. In distinction to what Prof. Kolkunov found in wheat, the stomata on the lower surfaces of the oats examined by the writers were invariably the larger.

As to the regularity with which the stomata are distributed on the leaf surface, it has also been observed that the number of openings increases in the direction of the tip of the leaf, but their length decreases.

The observations of Prof. Kolkunov, who succeeded in establishing a number of correlations between the anatomical and physiological characters of some varieties of maize and wheat, were not confirmed by the writers' experiments on varieties of oats. For these investigations they selected those properties, which are most important for summer cereals in a fairly damp climate with a moderate summer temperature, *i. e.* the length of the vegetative period, the degree of rust resistance, etc.

From these observations, there appears to be no connection between the length of the stomata and the length of the vegetative period. Mesdago, which generally ripens early, and Brie and Hudan, which are the latest, have stomata of the same size.

In the same manner, no regular correlation exists between the size of the cells and the amount of tillering. Three large-celled lines, C—311, A—321 and A—4113 tiller freely (3.3, 2.9, 2.5) but A—4051, a smaller-called variety, resembles them in this respect (2.4); whilst A—396, which tillers least (1.4), does not possess cells of the smallest size.

Eriksson and Marshall Ward only arrived at negative results respecting the connection between size of stomata and susceptibility to rust. According to the investigations of the writers, Lines C—311 and A—321, which have the biggest stomata which are also fairly numerous, are least susceptible to rust (*Puccinia coronifera* Kleb); this agrees with the results of Marshall Ward's researches, that " Susceptibility to or immunity from fungus attack does not depend upon the anatomical structure of the leaf, but upon one or more internal factors. "

Finally, as might *a priori* have been expected, yield, as a function of many factors, does not depend upon a single cause, and is therefore not entirely dependent upon the size and number of the stomata.

These negative results are neither improbable not unexpected. For, " in truth the structure of plant organs tells us very little concerning their functions, " as Johannsen writes in his *Elementen der exakten Erblichkeitslehre*. " The same structure in organisms permits of differences of function and thus it is clear that similarity of function cannot be uniformly assumed from similarity of form " (Pfeffers' *Pflanzenphysiologie*, p. 291).

The present subject leads also to the question of the correlation between various physiological functions and anatomical structure, and the possibility of determining the former from the study of the latter. " All such methods are based on the principle of correlative variability and have doubtless been of good service in facilitating quick classification, and easy valuation, but they have also led to grave error of judgment. " Johannsen, *Elemente* chapter XVIII.

The doctrine of correlation has itself undergone great changes in the course of the last few years; these are especially due to the influence of Mendelism, which insists upon the independence and integrity of characters.

It should also be mentioned that in addition to these 17 varieties of oats, 10 others were investigated, but are not described here. The results of these researches are on the whole in agreement with those described above.

357 - **Wheat Investigations in India.**

HOWARD, A. — *Report of the Agricultural Research Institute and College, Pusa, for* 1911-12, pp. 31-43. Calcutta, 1913.

One of the first results of the wheat investigations at Pusa was the demonstration that varieties of high milling quality could be grown in Bihar, and, by selection and hybridisation, these qualities have been successfully combined with high yielding power, rust resistance, and strong straw-yields of over 40 bushels per acre being obtained without irrigation or manure. During the years 1910-12, the trials of these new varieties were extended to other wheat-growing areas in India with the most excellent results. The new varieties were tested in the United Provinces, in the Punjab, in the Central Provinces, and in various other parts of Bihar both with and without irrigation. In all cases the yields obtained were well above the average for each district, and the grain was of high quality. A further proof. of the success of these new varieties lies in the great demand for seed which has arisen during the past few years, and which until now could only be met in part. However, arrangements have been made with three estates to grow a large stock of seed for distribution, which should be sufficient to satisfy all demands, whilst at Pusa the various strains will be maintained in pure culture for purposes of restocking.

A certain number of cultivation experiments are also being carried out at Pusa. The first, which concerns the continuous growth of a wheat without manure, shows that after five years' cropping the natural fertility of the soil is unaffected. The next deals with the treatment of the fallow ground previous to the sowing of wheat, and compares the effect of cultivating the ground during the hot weather with the more usual practice of delaying the first ploughing till after the commencement of the rains. The former system considerably increases the yields and the effect appears to be cumulative. Lastly it has been demostrated that waterlogging the land in September reduced the subsequent crop by 50 %, and this result was shown to be due to the lack of available nitrogen, caused, no doubt, by a change in the soil flora.

A considerable amount of breeding work was done during the years 1911-12 at Pusa, particularly with regard to the production of new rust-resistant varieties with high yielding powers and strong straw. Some interesting facts with regard to the inheritance of characters have been elucitated and a paper on this subject has been published. (1)

ROOT CROPS

358 - A Good Tuber Plant: *Arracacia xanthorrhiza.*

NOUGUI. A "mandioquinha" ou "batata salsa". — *Chacaras e Quintaes*, [Vol. VII, No. 1, pp. 8-9 + 3 figs. São Paulo, Brazil, January 15, 1913.

Arracacia xanthorrhiza Bauer (old synonym *Arracacha esculenta* D C), an umbelliferous plant, is indigenous to the Bolivian Andes (2), where it is also cultivated under the name of "sacharachaca." It is not widely spread; it is cultivated to a certain extent in Brazil, and deserves to be grown on a greater scale, as it produces a nutritious tuber; it resists frosts, is not exacting, and yields abundantly. It thrives in all kinds of soil excepting pure clay and it allows of the utilization of poor soils which cannot be used for other crops. After ploughing the soil lightly, the side shoots of the parent plant are set at about 30 inches each way from each other. Every plant produces 10 to 15 tubers; harvesting the crop commences the second year and continues throughout the year. Interculture consists in one hoeing.

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(1) See No. 118, *B.* Feb. 1913.

(2) According to the *Index Kewensis* Tomus I, p. 193, Oxonii, 1895, *A. xanthorrhiza* is a native of Jamaica. *(Ed.)*

FORAGE CROPS. MEADOWS AND PASTURES

359 - Two New Species of Clover.

DE DEGEN, A. (Director of the Royal Seed-testing Station, Budapest) in *Mark Lane Express*, Vol. 109, No. 4246, pp. 183 and 185. London, February 10, 1913.

In the autumn of 1910, the author was twice asked to report on seed samples which consisted of a mixture of *Trifolium parviflorum* and *T. angulatum*, and this year he estimates that there are 80 tons of this seed on the market. The two plants are almost always found growing together on the heavy alkaline clay soils of the Hungarian lowlands, where they form the chief constituents of valuable pasture and meadow. They are small annual clovers, and in wet years or in wet spots produce an abundant crop; under drier conditions the plants remain dwarf and therefore produce a short crop, but always of good quality. They are both very early plants, and after the middle of June, if the season be dry, become of little value; the production of large numbers of seeds, which are easily shed, facilitates the process of self-seeding.

Wherever similar conditions of soil and climate prevail, these species will probably give equally good results, but all experiments so far show that under other circumstances the plants are of no value.

The seeds are finely reticulated, especially those of *T. parviflorum*. which otherwise resemble those of Dutch clover (*T. repens*), while the seeds of *T. angulatum* are more similar to those of alsike (*T. hybridum*).

FIBRE CROPS

360 - Cotton Industry in the West Indies.

1. - SANDS, W. N. The Results of the Cultivation of Cotton in St. Vincent.
2. - TEMPANY, H. A. The Cotton Industry in the Leeward Islands.
3. - BOVELL, J. R. The Cotton Industry in Barbados.
4. - ROBSON, W. Cotton Selection in Montserrat.
5. - ROBSON, W. The Manner of Cross-Pollination of Cotton in Montserrat.
6 - ROBSON, W. Sakellarides Cotton in Montserrat.

— *West Indian Bulletin*, Vol. XIII, No. 1, pp. 1-28. Barbados, 1912.

I. — *Caltivation of Cotton in St. Vincent*

Exports of cotton:

Financial year April 1st, 1910, to March 31st, 1911	lbs.	540 339	£ 41 836
1903-04 to 1910-11	»	2 392 884	£ 160 407

Acreage planted (1911):

Sea Island cotton 3587 acres; Marie Galante 1093 acres; Total 4680 acres.

Estimated value of the 1910-1911 crops, based on the actual yield and prices:

561 526 lbs. Sea Island Cotton at 18 *d* per lb.	42 114
752 tons » » cotton seed at £ 5 per ton	3 760
26 748 lbs. Marie Galante cotton at 9 *d* per lb.	1 003
35 tons » » cotton seed at £ 5 per ton . .	175
Total estimated value . . .	47 052

Percentage of lint to seed cotton: 24 (Marie Galante, white) to 26.5 (Sea Island, white, and Marie Galante, stained).

Cotton growing is now the chief industry of St. Vincent. The Government Central Cotton Ginnery, managed by the Agricultural Department, is the largest in the Colony and deals with more than half of the cotton output. Under an Ordinance of 1909 all lots of seed cotton less than 100 lbs. in weight have to be sold to the Government Central Ginnery. The largest quantity, however, which can be purchased from any one grower without the permission of the Administrator is 4 000 lbs. The Central Ginnery anticipates one-quarter of the estimated value of the lint per lb., less 5 c. for ginning and shipping charges and export duty. At the end of the crop, a bonus equal to three-quarters of the net profits is distributed. This system of sale has encouraged cotton-growing by the peasantry. In 1911, 542 small planters grew Sea Island cotton on 916 acres. Selected and disinfected cotton seed is furnished to them at a low price by the Department of Agriculture.

Under the provisions of the Cotton Disease Prevention Ordinance of 1910 all growers are required to destroy by fire all cotton bushes of the previous cotton season on or before April 30 in St. Vincent and on or before March 31 in the Northern Grenadines. The Ordinance does not apply to the Southern Grenadines, where practically only the perennial Marie Galante cotton is grown.

Pests and Diseases. — No attack of the cotton worm (*Alabama argillacea*) has been recorded during the past four years; its chief natural enemy, the Jack Spaniard (*Polistes annularis*) is now protected on nearly all estates. The local cotton stainer (*Disdercus delauney*) is always found in large numbers towards the end of the crop. It is advised to destroy, besides the cotton plants toward the end of the season, other plants which supply food to this insect pest, that is the silk cotton (*Eriodendron anfractuosum*, John Bull or Mahoe (*Thespesia populnea*), Tobago bread nut (*Pachira spruceana*) and Ochro (*Hibiscus esculentus*). Damage was also caused by the leaf blister mite (*Eriophyes gossypii*) and black scale (*Saissetia nigra*). *Bacterium malvacearum* and anthracnose (*Colletotrichum gossypii*) were the most dangerous diseases.

2. — *The Cotton Industry in the Leeward Islands.*

Acreage planted (1911-1912):

Antigua	517 acres	St. Kitts	1650 acres	Montserrat	2500 acres (estimated)
Barbuda	130 »	Nevis	2000 »	Anguilla	800 » (estimated)

Cotton crop of 1910-11 in Antigua: 96 992 lbs of lint: average yield 173 lbs par acre.

Exports of lint (1910-1911):

St. Kitts	329 322 lbs.	Total return of lint per acre 216 lbs.
Nevis	343 395 »	
Anguilla	148 595 »	
Montserrat	109 000 »	(Up to November 1911).

In Anguilla, the young crop has suffered very much from the attack of a small beetle which cuts down the young plants. At Montserrat the growth suffered from the attacks of the cotton stainers (*Dysdercus andreae*) and of the flower-bud maggot (*Contarinia gossypii*).

3. — *The Cotton Industry in Barbados.*

Acreage under cotton from 1906-7 to 1910 11 . . . . . . 28 624 acres
Average yield: Cotton lint 4 529 870 lbs. of the value of £ 285 746
» seed 11 144 421 » » » £ 24 791

The average production per acre, which was 338 lbs. of lint in 1902-1903 when cotton cultivation was begun in Montserrat, has constantly diminished and was in 1910-11 153 lbs. In order to counteract this evil, the Department of Agriculture has undertaken work for the improvement of the quality and quantity, either by selection or by crossing selected Sea Island cotton with very hardy varieties. The results so far obtained confirm those found by O. F. Cook of the Department of Agriculture of the United States, in that the hybrids proved to be very variable. These showed parental characters (those of the parent plants), interparental characters (intermediate), extraparental characters (not within the parental groups or between them). The latter could be divided into suppressed, intensified and primitive characters.

By the continued selection of a cotton which in 1908 had fibres 36.1 mm. long and 35.7 per cent. of weak fibre, and in 1909 yielded 2376 lbs. per acre of unginned cotton, in 1911 a variety, Grant, was obtained with fibres 46.2 mm. in length, 14.4 per cent. of weak fibre and producing 4 406 lbs. per acre of unginned cotton.

In 1909, this cotton was estimated at 11*d.* per lb. in 1911 at 16 to 17*d.* per lb., taking Sea Island cotton at 17 to 19*d.* per lb. as a base.

4. — *Cotton selection in Montserrat.*

Cotton selection has been carried on uninterruptedly at Montserrat since 1906. The following method of perpetuation of a particular strain is adopted. The seeds of the plant selected in 1909 are planted in the breeding plot in 1910. In this year six of the plants are marked and the seed-cotton collected into separate bags, the lint is submitted to spinning tests and the seeds of the two plants showing the most desirable features are retained for planting in 1911. The two plants in 1911 are treated as if they were separate strains, and six plants are again re-selected and the seed-cotton collected separately, from both types, the lint of the twelve plants being subsequently examined. Thus the inheritance both for breeding qualities (yield) and lint characters comes into perspective, and the type showing the best all-round features is perpetuated.

In the course of these selection experiments it has been shown that the germinating power of seeds can be destroyed by the heating of seed-cotton and also when seeds are stored in bulk after ginning. As a rule cotton seeds show a high germinative power as they come from the field, but when the cotton is picked, this is not always the case. This suggests the necessity for making germination tests before deciding which seeds are to be reserved for planting purposes. Thorough sunning of the seed-cotton before storing should obviate the possibility of heating, and subsequent to ginning the seeds should not be stored in large bulk.

5. — *The Manner of Cross-Pollination of Cotton in Montserrat.*

A large number of insects have been found in Montserrat associated with the cotton plant, such as the Jack Spaniard (*Polistes* sp.), lacewing flies (*Chrysopa* sp.), lady-birds, grasshoppers, *Syrphus* or hovering flies, etc. More closely associated with the flowers were beetles, ants, honey bees, one or more species of small Dipterous flies and an unidentified species of thrips. The Dipterous flies and the thrips may aid self-fertilization to a little extent. While the bees *Dielis dorsata, Centris haemorrhoidalis* and *Megachile* (?) *martindalei* carry pollen from one flower to another. The average percentage of flowers cross-pollinated by *D. dorsata* is thought to be 21, ranging from 4 on a dull, showery day to 33 per cent. on a bright day.

6. — *Sakellarides Cotton in Montserrat.*

The following are the results of preliminary experiments conducted at the Experiment Station in Montserrat during 1911-1912.

Yield of seed cotton: plot *a* (1/28 acre)	1 475 lbs. per acre
» *b* (1/4 ») about	936 » » »
Number of bolls required to make 1 lb. of seed cotton	138
Average lint length	1 ½ in.
Percentage of lint in selected plants	30
Weak fibre eliminated by means of the weaver's comb.	11.8

The behaviour of the plants on the whole indicates that this type will prove to be hardier and a heavier cropper than the Sea Island cotton.

361 - Cotton Experiments in the Cape Province.

VAN RYNEVELD, A. in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 6, pp. 831-842+XII plates. Pretoria, December 1912.

Attempts at growing cotton have been made in various parts of the Cape Province, but the absence of any system of experiment and the want of the necessary supervision have made the results practically useless. A large portion of the Cape Province is not suited to the growing of this crop, and it was resolved to test the suitability of a certain area where the conditions of labour, soil, climate, and rainfall seemed to indicate the best chances of success. The site chosen was at the Big Umgazi, in the District of Port St. John's, Pondoland. The soil consists of a rich, dark, heavy sandy loam, and was moderately moist at planting time.

Ten pounds of seed was used per acre. The land was only ploughed up once, namely just before planting, and harrowed. A shower of rain (about 0.35 in.) fell the evening after planting. Plants were thinned out when 14 days old and again at one month. The perennial varieties — that is the Sea Island and Egyptian — were planted from 5ft. to 7ft. apart in the rows. The rows of the rest were 4 ft. apart. The annexed table shows the results obtained :

Date of planting	Variety planted	Height of Plant		No. of Bolls to Plant		No. of Bolls to 1 lb. of Seed Cotton		Percentage of stand	Size of Plot	Yield per acre
		Selected	Average	Selected	As found	Selected	As found			
		in.	in.						acres	
1911 October 28	Sea Island.	102	78	188	150	89	112	99	5	1 369.8
» 29	Egyptian Mitafifi. . .	102	78	222	99	98	119	94	3	1 285.6
» 29	American Toole . . .	60	51	130	71	66	75	80	2	2 067.5
» 30	Nyasaland Upland . .	72	60	168	97	68	73	52	3½	1 548.2
» 30	Cleveland Big Boll . .	54	48	59	39	43	52	100	½	1 010.0
» 30	Herlong	48	45	57	34	—	—	100	½	810.0

The Sea Island and Egyptian varieties grew out almost too luxuriantly, so that the sun was excluded to a great extent and only about half of the bolls ripened. The annuals also grew out well and gave very satisfactory yields.

Weather conditions were favourable during planting time, but a protracted period of drought set in when plants were about six weeks old. The crop was freely cultivated and a certain amount of hand-hoeing was also done to keep the field clear of weeds.

The following is the cost of production and estimated profit per acre of the different varieties planted :

	£.	s.	d.
Sea Island			
Preparing and ploughing	0	10	0
Harrowing	0	1	0
Planting	0	1	0
Seed	0	1	0
Chopping (thinning out)	0	2	0
Cultivating and hand-hoeing	0	12	0
Picking	1	16	0
Transport	0	4	0
Wear and tear of implements	0	1	0
Sundries	0	2	0
	£ 3	10	0

1 369 seed cotton at 3 *d.* per lb.	17	2	3
Less cost of production	3	10	0
Estimated profit per acre	£ 13	12	3

Mitafifi

1 285 lbs. seed cotton at 3 *d.* per lb.	16	1	3
Less cost of production	3	0	0
Estimated profit per acre	£ 13	1	3

American Toole

2 067 lbs. seed cotton at 3 *d.* per lb.	25	16	2
Less cost of production	3	10	0
Estimated profit per acre	£ 22	6	9

Nyasaland Upland

1 548 lbs. seed cotton at 3 *d.* per lb.	19	12	0
Less cost of production	3	0	0
Estimated profit per acre	£ 16	12	0

Cleveland Big Boll

1 010 lbs. seed cotton at 3 *d.* per lb.	12	12	6
Less cost of production	2	15	0
Estimated profit per acre	£ 9	17	6

Herlong

810 lbs seed cotton at 3 *d.* per lb.	10	2	6
Less cost of production	2	15	0
Estimated profit per acre	£ 7	7	6

The cost of production per acre varies in the different varieties owing to additional cost of picking of one variety as compared with another. The cost of picking was higher in the case of the Sea Island owing to the bolls not opening well and in the case of the Toole owing to the heavy yield.

The second year crop of the Sea Island variety is of very good quality and of satisfactory yield.

The only insect pest which troubled the field in question was cotton stainer (*Dysdercus superstitiosus*) but not to any great extent.

362 - Cotton Experiments in British Guiana.

HARRISON, J. B. and STOCKDALE, F. A. in: *West Indian Bulletin*, Vol. XIII, No. 1, pp. 40-55. Barbados, 1913.

Experiments in growing different foreign varieties of cotton have been in progress for some time (*West Indian Bulletin*, Vol IX, pp. 213-214). None of the varieties grown however paid for the cost of their cultivation, so that these experiments were discontinued after 1908, and attention was given to producing hardy varieties suitable for the heavy clay soils of the coastal region.

The writers give tables incorporating the data resulting from the observation of 103 hybrid Sea Island and Buck plants (indigenous variety) of four generations (100 individuals per generation) F_1; of 274 F_2 plants; of 436 F_3 plants (derived from the seeds of 7 F_2).

While refraining from discussing these data in detail, until those from a further generation are available, the writers state that it is now possible to select, even in three generations, cottons that seem to be practically true to type. Variety 59.66, an extracted sea Island cotton, grows vigorously on heavy clay soil and under meteorological conditions where the ordinary commercial strains of this cotton refuse to grow. Variety 59. 33 is also interesting from its short staple cotton and comparatively early maturity.

Trials have also been made in crossing indigenous cottons from the Rupununi district with Sea Island, and the results seem encouraging.

363 - Action of Light on the Growth of Seed Beets.

SUGAR CROPS

STROHMER, F. Einfluss der Belichtung auf das Wachstum der Samenruben. — *Mitteilungen der chemisch-technischen Versuchsstation des Zentralvereines fur die Rubenzuckerindustrie.* Serie IV, No. 41 *Oesterreichisch-Ungarische Zeitschrift fur Zuckerindustrie und Landwirtschaft*, Year XLI, Part 6, pp. 913-931. Vienna, 1912.

In a preceding work of Strohmer, Briem and Fallada (*Oesterreichisch-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XL, 1911, p. 11) it has been demonstrated that a lack of light during the first year of vegetation causes in beets a considerable development of the leaves at the expense of the root, and modifies unfavourably the composition of the dry matter of the root from an industrial point of view by diminishing its sugar content. The writers proposed to ascertain if in the second year of vegetation the lack of light favours the development of the upper part of the plant at the expense of the lower and whether it increases the production of seed or modifies its characters.

The first series of experiments, like the preceding ones, was conducted at the Wohanka station for the production of beet seed at Uholiczky near Prague. Three one-year-old beets (I, II, III), of equal weight and sugar content (18.0 per cent.) were halved, one of the halves (*a*) was planted so as to receive the sunlight for three quarters of the day, the other half (*b*) was placed under some trees so as to be always in the shade. The results obtained in a dry year, 1911, are shown in Table I.

TABLE I.

	I		II		III *	
	(a) half	(b) half	(a) half	(b) half	(a) half	(b) half
Weight of seed . . . . . grams	98	25	106	28	23	1.4
» » stems and leaves »	134	57	132	69	71	2.6
» » roots . . . . . »	85	55	92	58	62	14.0
Seed clusters, weight per cent. of those produced by (a) halves	—	25.5	—	26.4	—	6.1
Number of clusters in 1 gram .	78	94	74	84	90	111
Size of clusters . . . . . mm.	3.5–4	3–3.5	3–3.5	3–3.5	3–3.5	3

* The beet was not perfectly sound.

In the germination tests no essential difference was observed between the seeds produced in the sunlight and those in the shade.

The seeds of this generation were used in cultivation experiments carried out, with the usual tillage and manuring, in 1912 at Gross Zinkendorf, Hungary and at Dürnkrut, Lower Austria. Numerous and detailed tables give the meteorological observations, cultural and analytical results. Table II. refers to the sugar content.

TABLE II. — *Sugar Content of Beets.*

Experiments at Gross-Zinkendorf.

	Offspring of the half kept in the sun				Offspring of the half kept in the shade			
	Number of beets analysed	General average %	Maximum %	Minimum %	Number of beets analysed	General average %	Maximum %	Minimum %
Beet I . . .	58	**19.80**	21.00	17.60	57	**20.18**	21.20	18.60
Beet II. . .	59	**20.04**	21.00	19.10	58	**19.88**	21.35	18.40
Beet III . .	18	**19.74**	20.90	18.25	18	**19.48**	21.00	17.30

Experiments at Dürnkrut.

	Offspring of the half kept in the sun				Offspring of the half kept in the shade			
	Number of beets analysed	General average %	Maximum %	Minimum %	Number of beets analysed	General average %	Maximum %	Minimum %
Beet I . . .	18	**18.48**	19.25	16.60	16	**18.26**	19.20	16.40
Beet II. . .	17	**18.61**	19.40	18.05	18	**18.25**	19.20	16.10

The results obtained show " that the lack of sunlight acts unfavourably on the development of the parent beets to the extent of diminishing the production of seed clusters. The size of these is inferior to that of normal clusters and they often give rise to weak plants. Nevertheless, when the latter have attained a normal development, their yield, sugar content and chemical composition does not allow an unfavourable effect of the lack of sunlight on the parent root to be recognized ; so that such offspring is perfectly equal to that of beets of the same kind grown under perfectly normal conditions. "

These results agree with others obtained by the same writer (*Oesterr.-Ung. Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XXXIX, 1910, p. 919) which show that the character of sugar content of beets is preserved even through a generation grown under different climatic conditions. It may thus be affirmed that the sugar content of beets deriving from individual selection is a hereditary and transmissible character.

304 - **Cultural Accounts and Production of Sugar Cane cultivated on the Share System.**

Resultado del costo de la caña de azùcar cultivada por colonos, segun las prácticas adoptadas en Cuba. — *El Hacendado Mexicano*, Year XIX, Vol. 10, pp. 52-53. Mexico, February 1, 1913.

It has been suggestvd to employ colonists for the cultivation of sugar cane and to purchase and work up their production in large central factories. But as far as the writer knows the advice has been followed only on one estate near Tampico, where it has given excellent results. In order to show the advantages of the system the writer quotes the example of Cuba, where it is common, and gives the following data referring to the system, which are taken from official documents and from Cuban sugar factories.

Crop of canes: average (60 000 arrobas per caballeria)	45 235 lbs. per acre
good (80 000 » » »)	60 313 » » »
Yield of sugar from average crops:	
average yield 12 per cent.	5 428 » » »
good yield 12.5 per cent.	5 654 » » »

The factory gives the grower on the share system from 40 to 52 % of the sugar extracted from the canes he delivers, namely:

a) average crop, yield of sugar 12 per cent.	
giving the growed 40 per cent. of the sugar	2 388.32 lbs. per acre
at $2.80 per cental	$66.87 » »
b) average crop	
giving the grower 48 per cent. of the sugar	2 605.44 lbs. » »
worth	$77.95 » »
c) average crop	
giving the grower 52 per cent. of the sugar	2 822.56 lbs. » »
worth	$79.03 » »
d) good crop	
giving the grower 40 per cent. of the sugar	2 895.00 lbs. » »
worth	$83.67 » »

Cost of production of 1 acre.

Preparation of the soil	
Clearing	$1.50 to 10.00
First ploughing	4 — » 6 20
Second »	2.70 » 3 —
Harrowing	1 — » 1.25
Preparation of the beds	1.25 » 1.65
Total . . .	$10.45 to 22.10
Sowing	
Canes	$4 — to 5 —
Carriage	0.50 » 0.70
Cutting into pieces	0.50 » 0.80
Planting of pieces	2.50 » 3.50
Covering with earth	3 — » 3.80
Total . . .	$10.50 to 13.80
Interculture	
Cost of three hoeings	$10.55 to 12.60
Cutting the canes and carriage to the mill	
Cutting and loading	$12 75 to 18 —
Carting	9 — to 18 —
Total . . .	$21.75 to 36 —
General total . . .	$53.25 to 84.50
Cost of renewing the seed	$15 per acre

Balance of a plantation lasting six years and yielding 45 235lbs of canes per acre per annum.

Sowing, interculture, and cutting the first crop	$ 60 per acre
Interculture and cutting each successive crop: $10 per acre for five crops	200 » »
Cost of production of six crops	$260 »
Canes produced per acre 45 235lbs.; sugar 12 per cent.; share of the grower 48 per cent. of the sugar, that is	2 605.4 lbs. per acre
at $2.80 per cental. . .	$72.95
and for the six years. .	$437.70
Difference between outlay and returns for the six years . . .	$177.70

From this difference the fixed expenses are to be deducted. These are estimated as follows for a farm of 3 caballerias (about 100 acres):

Construction of dwelling	$300
Nine yoke of oxen	900
Two horses	130
Implements	220
Enclosures	250
Pasture for live stock	60
Carts for trasport of cane	140
Total . . .	$2 000

Share per acre of above expenses	$20.25
Interest at the rate of 8 per cent. for 6 years and per acre.	9.72
Depreciation 40 per cent	8.10
Total fixed expense per acre after six years	$17.82
Difference between the value of the sugar delivered to the grower and the cost of production of the cane, for six years.	$177.70 per acre
Fixed expenses for six years	17.82 » »
Profit during six years	$159.88
Yearly profit.	26.64

The above profit refers to average soils and years; under favourable conditions a profit of $40 to $45 per acre and upwards may be realized.

365 - The Yield of Hevea in Java.

RUBBER, GUM AND RESIN PLANTS

DE WILDEMANN, E. La Production de l'Hevea à Java. — *Le Caoutchouc et la Guttapercha,* Year 10, No. 108, p. 6 995. Paris, February 15, 1913.

BERKHOUT, A. H. L'Hevea à Java. — *Bulletin de l'Association des planteurs de caoutchouc,* Vol. V. No. 2, pp. 38-39. Antwerp, February 1913.

Dr. P. Arens has published a study on the yield of some Hevea plantations (1). The experiments dealt with the trees of six plantations and the yield per tapping varied from 1.05 to 2.94 grams. In the year one can reckon upon 180 days in which tapping is done, which gives a yield per tree and per year of 348 to 648 grams. A first conclusion can thus be drawn that in Java, trees from 5 to 7 years old can produce an average of 500 grams (over 1 lb.) of rubber per year. Another point to which the writer draws attention is the lower yield of plantations in which the trees are crowded. It appears also from observations made in Java that daily tappings are more productive than those made every other day. Dr. Berkhout, former conservator of forests in Java, observes on the other hand that the yield in Java is not inferior to that obtained in the Malay peninsula.

Among many other plantations situated in the Island of Java, the writer mentions only those in the Preanger Regency. In the plantation of the Bajabang company, during the first year of tapping, the tappings commenced in January on 22 800 trees were extended to 42 835 trees in December with a total production of 26 730 lbs. In the plantation of the Tjondog company 21 000 trees yielded 2 628 lbs. per month and an average of 750 grams (1 lb. 10 oz.) per tree tapped was expected for the first year. In the plantations of the Franco-Dutch Colonial Planting Company the first trees were tapped at the age of only 4 years. In 1911, 104 890 trees were tapped, yielding 171 310 lbs. The yield according to age was as follows:

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(1) *Proefstation de Malang, Bull.* No. 3. Java. *(Author's note).*

			Grams per tree
Trees	planted	in 1904	1 270
»	»	1905	826
»	»	1906	683

These figures, higher than those quoted by M. Arens, seem to M. Berkhout to leave no doubt as to the normal yield of thriving trees in a well-managed plantation.

366 - On the Existence in West Africa of Two Stable Forms of *Hevea brasiliensis* with Different Rubber Yields.

BRET, C. M. Sur l'existence, en Afrique Occidentale de deux formes stables d'*Hevea brasiliensis* à rendement différent. — *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 6, pp. 478-479. Paris, February 10, 1913.

Hevea brasiliensis, which is almost exclusively cultivated in the rubber plantations of the Far East, has hitherto given rise to very slight variations from the usual type. The writer, during the time which he lived on the West Coast of Africa, had occasion to observe two *Hevea* plantations; the trees were not of the same origin and their latex yield appeared to be different.

One of the two varieties, which formed a stand of 70 trees at Dabou (Ivory Coast), was more vigorous in appearance than the other, from which its anatomical characters distinguished it very clearly. The latter, of which there was a stand of 6 trees at Porto-Novo (Dahomey) yields a larger amount of rubber.

The characteristic anatomical difference consists especially in the fact that in the high-yielding form the swollen basis of the petioles has a number of laticiferous tubes in the cortical parenchyma, especially on the ventral surface, and in the liber, while in the more vigorous Dabou form the laticiferous tubes are much less numerous.

These two forms of *Hevea* have a different origin; the trees in the Dabou stand were grown directly from seed collected on the Lower Amazon, while the Porto Novo trees came from the Ebute Meta station (Lagos), having been sent out from the Royal Botanic Gardens at Kew.

The writer's experiments show that the offspring of these two forms retain the characteristic differences in vigour and yield, even under different conditions from those prevailing where they were first observed.

The easy method which allows these forms to be recognized by the observation of the anatomical structure of the base of the petioles is to be recommended, as it might be used to effect a rapid selection.

367 - Manihot and Hevea.

Manihot et Hevea. — *Journal d'Agriculture Tropicale*, Year 13, No. 139, pp. 7-10. Paris, January 31, 1913.

In an article signed F. V. (1) the question of the advisability of cultivating Manihot and Hevea side by side was raised and answered affirmatively. Further, as M. Girard, who has practised this mixed cultivation in Cochin-China since 1910, using *M. dichotoma* and *pianhyensis*, asked for information respecting the best methods of tapping, for only by means of applying tapping methods entirely satisfactory to himself, would he be able to give, in his turn, interesting information on the mixed cultivation of Manihot and Hevea in Cochin-China and on the results of his experiments in incising Manihot trees. It was thus useful to add to the information which M. F. V. was able to furnish on this subject the data collected by M. V. Cayla in the course of a visit to the Brazilian plantations of various species of Manihot.

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(1) See *Journal d'Agriculture Tropicale*, No. 132. June 1912. (*Ed.*).

The following method is advocated by M. F. V. as the result of his practical experience on the Congo.

1. The thick bark of the trees should be removed in order to obtain a smooth clean surface.
2. The tree should be divided into 4 sectors and the incisions made in the form of half a fish-bone to a height of 6 ft 6 in. from the foot of the tree and 6 in. apart.
3. One sector must be incised per day and the next day the scrap should be removed, the incisions being sprayed with Bordeaux mixture. As soon as the cuts have cicatrised, the process is repeated, the new incisions being made below the former ones.
4. The best time for tapping is before 8 a. m., but it can be continued during the day in the case of trunks in the shade.
5. An ordinary implement is used, care being especially taken to avoid injuring the cambium.
6. No tree should be tapped till it is 4 years old.
7. The latex should be allowed to coagulate without being disturbed, and preferably in the form of " crêpe ".

M. V. Cayla states that in Brazil in the State of Rio Janeiro, it is necessary to remove the thick bark from *Ceara* trees (*Manihot Glaziowii*) of from 7 to 8 years of age, or more, in order to make clean-cut fish-bone incisions. In the case of the other species of Manihot, a rapid and slight scraping with the cutting knife is all that is requisite.

M. Glaziowii is tapped with a " machadinho " (1) according to the method of the " seringueiros ", but *M. pianhyensis* (" pianhy ") and *M. dichotoma* (" jéquié ") are treated in a still rougher manner; while the latex from *M. Glaziowii* is collected in receptacles (" tigelinhas ") suspended from the trees below the incisions, that from *M. dichotoma* flows into a vessel at the foot of the tree, while the latex exuding from *M. pianhyensis* flows into a hole dug in the ground.

The fish-bone incision is not practised in Brazil, where it would not be economical in the case of *Ceara* on account of the peculiar nature of the bark of this tree.

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(1) A small axe used by the " manisobeiro ". Cfr. *Le Manisoba* by A. Moulay. Paris, Challamel, 1906. (*Ed.*).

But the diameter and height of the Manihot trees depend on cultural methods, which seem to be completely ignored in the State of Bahia, where the want of care taken does not permit of stating with accuracy the height to which incisions can be made. The trees are tapped as high as possible; small incisions can be made in nearly half the circumference of the trunk of *M. dichotoma* without causing any injury to the tree.

As for the age, it is better not to begin tapping too early. Nevertheless, *M. pianhyensis* is often tapped when 2 years, or even 18 months old and the dead tree is replaced by a fresh productive tree grown in 6 months by filling up the gaps with slips.

The rubber from the Brazilian species of Manihot coagulates of its own accord; its quality is good and it fetches a high price. It is, however, deficient in purity, but this might be remedied by filtering the latex before coagulation, pressing and drying the coagulum with care.

368 - **Technological Study of the Congo Varieties of Rubber.**

Étude technologique de Caoutchoucs du Congo. — *Ministère des Colonies. Bulletin de l'Office Colonial*, Year 6, No. 62, p. 63. Melun, February 1913.

1. Rubber from Oubangi: *Funtumia elastica.* — Being little vulcanised, this is less tenacious, less resilient, less elastic, more supple and more extensible than " fine Para hard cure ". But when more vulcanized it is equivalent to it. It is a rubber quite comparable with the best wild Para kinds.

2. Rubber from the Upper Chari: *Landolphia ovariensis.* — Extracted by pounding the rhizomes of dwarf varieties of *L. ovariensis.* This is a liana rubber of average quality.

VARIOUS CROPS

369 - **Study of *Coffea robusta*** (1).

DE WILDEMANN, E. Etude sur le *Coffea robusta.* — *Bulletin de l'Association des Planteurs de Caoutchouc*, Vol. IV, Nos. 3, 4, 12, and Vol. V, N°. 2, pp. 54-56, 78-79, 274-276 and pp. 28-31. Antwerp, March, April, December 1912 and February 1913.

For some years past, the question of *Coffea robusta* and of its cultural value has been dealt with in all Colonial Agricultural Journals. In this article, the writer has collected all the data, which seem favourable to a large extension of the cultivation of this plant. Already in 1909, he maintained, in a paper contributed to the *Annales du Jardin Botanique de Buitenzorg* (2), and containing an exhaustive bibliography of the cultivated varieties of *Coffea*, that *C. robusta* is not a species, but a variety or form of *Coffea canephora*, indigenous in Central and West Africa.

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(1) This plant, which has been collected by M. Ed. Luja in the Belgian Congo and by M. Chevalier in the French Congo, is known in some recent treatises under the name of *C. robusta* Chevalier. It is not mentioned in the *Index Kewensis* and supplements issued up to 1908. The seeds for the plantations in the Dutch East Indies came from Brussels. *(Ed)*.

(2) Materiaux pour une étude botanico-agronomique du genre *Coffea* (Caféiers cultivés). *Annales*, Series 2, Suppl. III. Java. *(Author's note)*.

C. robusta, when carefully cultivated, forms a shrub with horizontal or decumbent branches, which at the flowering and fruiting seasons, literally bend beneath the weight of the flowers and fruit. This productivity is one of the characteristics of the variety from the economic standpoint; for no other kinds of cultivated coffee plants bear so many seeds. Another important characteristic which must be dwelt on is its early maturity; it is in full bearing long before *C. liberica* and *C. arabica* and before *Hemileia* has developed sufficiently to hinder its fructification to any noticeable extent.

But the success of *C. robusta* is especially due to the fact that it will grow between *Heveas* and to the economic results obtained by using it as a grafting stock (3).

UNITS OF YIELD. The yield of this plant is one of the most remarkable; the following table published by the *Jaarbock* of the Department of Agriculture of Java, gives the crop from different coffee plants of the same age and grown under identical conditions:

	Weight of seeds per plant	
Java coffee	53 to 97	grams
Maragogype	14 to 18	»
Moka (small berries) . . .	27 to 38	»
Moka (large berries) . . .	118	»
Robusta	992	»
Quillou	1020	»
Maragogype on Quillou .	26	»
» » Robusta .	156	»
Eugenifolia.	20 to 133	»
Lancifolia	10	»
Erecta	43	»
Cochleata	12	»
Rotundifolia	40	»
Laurina	83	»
Unisperma	20	»
Columnaris	17	»
Angustifolia	60	»

The two African varieties, *Quillou* and *Robusta,* are the ones which give the highest yields, while *Maragogype* grafted on *Quillou* produces 26 grams of seed per tree and on *Robusta* 156 grams per tree, which is a larger crop than any produced by the cultivated varieties formerly grown in Java.

SELECTION. An interesting question has been raised of late as to the flavour and commercial value of the coffee from the different varieties of coffee plants; this leads to a consideration of the necessity of improving the cultivated species and varieties by means of selection.

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(3) This association of crops occurs in Sumatra and Java; *C. robusta* has also been advantageously employed as an intercalary crop in coconut plantations. See No. 40, *B.* Jan. 1913. (*Ed.*).

This is the more important, contrary to what has been affirmed respecting other species of *Coffea*, and especially by Dr. von Faber as regards *C. liberica*, seeing that self-fertilization never takes place in the group of *Coffea canephora* to which *C. robusta* belongs; cross-fertilization is the invariable rule. This being the case, it is necessary to protect the plant from bad qualities being introduced by strange pollen. Very careful selection is therefore necessary to ensure good returns and, according to Dr. P. S. Cramer, attention must be directed to the following points:

1. Growth, resistance to fungoid leaf diseases, ramification.
2. Annual production, early ripening of crop, distribution of flowering periods throughout the year.
3. Crops, proportion between good and aborted seeds, thickness of the testa of the fruit.
4. Shape, colour, size of berries.

All selection work, however, presupposes a knowledge of the forms to be adopted and the value of their produce; unfortunately much confusion still prevails in these matters, as is shown by the different opinions summarized by the writer as to the determination and classification of the various kinds of coffee cultivated.

Mr. Wurth, of the Special Coffee Station at Java, divides the cultivated varieties of coffee plants into 3 groups of which the types are *C. arabica*, *C. liberica* and *C. robusta*:

Arabica: *congensis, stenophylla*.
Liberica: *abeocuta, excelsa*.
Robusta: *canephora, Quillou, Uganda*.

Mr. Wildeman, on the contrary, considers *robusta* as a variety of *canephora*, and *Quillou* as identical with *C. canephora* var. *Sankaruensis*, which together with *robusta* and *Laurentii* are a sort of *canephora* exported with the latter varieties from the Congo. At all events, if *Coffea arabica* seems to be very variable, this is equally the case with *C. canephora*, and it is impossible yet to be sure whether the *Quillou* variety grown in Java is actually the *Kouilouensis* (Pierre), variety of *canephora*, or another African variety of the same species, or even a new local form derived from a plant introduced into Java. All these questions, which are of great scientific and practical importance, still remain to be solved.

CULTURAL EXPERIMENTS. In Java, the answer to these problems is being sought by means of comparative experiments of the greatest interest. The results of Dr. Cramer's study of the proportion of fresh fruit to the berries ready for sale are all in favour of the *canephora* group and therefore of *Coffea robusta*, seeing that 4 or 5 lbs. of its fresh fruit furnish 1 lb. of berries, while in the case of *liberica* and *Coffea arabica* 7.85 to 15 lbs. and 5 to 6 lbs respectively are necessary to supply the same weight of coffee berries ready for the market.

Other experiments undertaken for the purpose of ascertaining whether the *Quillou* variety was suitable for planting on the sandy soils of Kloet in Java showed that:

1. In the majority of cases *Quillou* thrives as well as *robusta* in the Kloet nurseries and it is only very rarely more backward in growth than the latter.
2. Shortly after being planted out, both varieties develop equally well.
3. Until its second year, the *Quillou* variety grows a little less rapidly than *robusta* on the Kloet soil, but after this period it makes up for lost time and becomes as vigorous as the latter. Their value consists in the uniformity of the type.
4. Under the present conditions, the yield of *C. Quillou* on the soils of Kloet is less than that of *C. robusta* when grown in the same circumstances.
5. In the district in question, *C. Quillou* is of less cultural value from a general point of view than *C. robusta.*

Other cultural experiments have, however, not given the same results. When the *Uganda, Robusta* and *Quillou* varieties are planted so as to compare them with each other and using *Leucoena glauca* as a shade tree, if they are cut at a height of 5 feet and placed 10 ft. × 10 ft apart, they give the following amount of coffee ready for the market.

Uganda . . .	10.44 piculs	per bouw	or about	800 lbs.	per acre
Robusta. . .	16.60 »	»	»	1250 »	» »
Quillou . . .	21.21 »	»	»	1600 »	» »

CULTURAL METHODS AND SHADE PLANTS. — It is necessary to choose, by means of preliminary experiments, the variety of coffee to be cultivated; this however, is not all, for the cultural methods most suitable to the given variety must be selected and the variety of shade plant to be used. The experiments of M. Boon in the experimental plantations of the Dutch East Indian Government at Bangalan, Java, show that the yield of the same variety varies with the shade plant employed.

Ratio of yields of cultivated coffee plants grown under the following shade plants:

Solanum grandiflorum	1.59
Adenanthera pavonina	1.82
Cæsalpinia arborea	2.17
Acacia tomentosa	2.43
Hevea brasiliensis	2.77
Albizzia moluccana	2.82
Pithecolobium Saman.	3.06
Grevillea robusta	3.49
Erythrina lithosperma	4.10
Leucæna glauca	4.75

EXTENSION AND PROGRESS OF THE CULTIVATION OF *C. ROBUSTA*. — In order to obtain an idea of the popularity enjoyed in Java by coffee plants belonging to the *canephora* group, it is only necessary to consult statistics on the subject and especially those compiled by the Agricultural Syndicate of the Dutch East Indies. According to the latter, 24 521 000 plants of *C. robusta* have been planted in the 4 years from 1907 to 1911. The statistics of yield and of plantation communicated at a meeting held at Malang in May 1912, gave the following figures for plantations:

	1911 Crop	1912 Estimate	Plantations 1911-1912
C. robusta and species of the same group	54 685 cwt.	94 312 cwt.	4 686 542 trees
Java	42 873 »	74 460 »	—
C. liberica	15 616 »	9 164 »	12 150 »
Hybrid	1 763 »	3 445 »	80 476 »

These few figures, although incomplete, seem to justify the opinion expressed by Prof. Treub, late Director of the Buitenzorg Botanic Gardens, that soon 60 000 tons of Javanese coffee of Congo origin may be expected on the market. They also show very clearly the progress made in the cultivation of the *canephora* species. The same is affirmed to be the case in Madagascar, where the *canephora* variety is preferred to the *liberica* on account of its early and abundant crops, of which the commercial value exceeds by 8*s*. or 12*s*. per cwt. that of the *liberica* coffee from the same district.

Nevertheless, the cultivation and exploitation of the coffee plant in Africa have made but little progress in comparison with the extension of the cultivation of coffee from the centre of Africa, which has taken place in India and the Far East. It should, however, be added that coffee is increasingly grown in some of the German colonies in Africa.

The area under coffee in 1909 was estimated at 1 976 acres in Usambara, and the amount of coffee which could be obtained in Massai was reckoned at 2.2 lbs. per tree, 400 trees being planted per acre.

DISEASES AND ENEMIES. — Dr. H. Morstatt, of the Amani Botanical Station has published a long list of the fungoid and insect pests which attack the coffee plants of this colony (1).

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(1) Dr. H. Morstatt. Die Schädlinge und Krankheiten des Kaffeebaumes in Ost-Afrika, *Beiheft zum Pflanzer*, Amani, July 1912.

(*Author's note*).

Hemileia is now found in all the tropical regions of the globe and though *C. robusta* is more resistant than the other species, it seems not to be completely immune from this parasite. In 1903-04, M. E. Laurent brought back from the Congo numerous specimens of the *canephora* and *robusta* groups of which the branches and leaves were attacked by this parasite. Other diseases of *C. robusta* have been recorded.

Stem canker, due probably to a fungus, *Ascospora Caffeae*, seems to have been able to develop because the plantations were at first very thick, but its extension has been hindered by planting the shrubs further apart and by burning all infected individuals.

Cercospora caffeicola and *Xyleborus*, the Boebock of the Indians, do more damage on the *robusta* than on the *Java* and *liberica* groups; but *Corticium javanicum*, the Djamoer-oepas of the Indians (produced by *Lecanium viride*), and eel-worms seldom or never attack *robusta*.

All these considerations show how important it is not to send seeds from Africa to new plantations without having taken all the precautions necessary to the interests of the planters.

COMMERCIAL VALUE OF THE PRODUCT. — It is objected that the berries of the *robusta* group and of other African coffees are small in size and inferior in flavour; but the continually increasing quantities of these coffees sold in Holland and the satisfactory prices they fetch show that the public is beginning to appreciate them. No objections will be made to the size of the berries, when by means of careful cultivation and especially of right preparation, a coffee is obtained equal in flavour to the (old) Java and Arabian coffees.

370 – Cacao in the French Colonies.

PRUDHOMME, EM. Le Cacao dans les Colonies françaises. — *Annales de la Science Agronomique*, Year 39, No. 1, pp. 13-19. Paris, January 1913.

The amount of cacao imported into France has progressed regularly from 2000 tons in 1850 to 27 000 tons, representing a sum of £1850 000 in 1911 (1).

Of this, the amount of re-exported cacao was double that consumed. The cacao imported into France during the last few years comes principally from Venezuela, Brazil, Ecuador, St. Domingo, the Gold Coast, Colombia, San Thomé, Trinidad and Haiti. The re-exported cacao was sent chiefly to Germany, Switzerland, England and Belgium. In 1911, 4 149 952 lbs. of cacao was imported into France from the French colonies (50 per cent. of duty remitted); this was divided a follows:

Guadeloupe	2 332 733 lbs.	Madagascar	45 797 lbs
Martinique	1 336 237 „	Ivory Coast	33 174 „
Congo	237 833 „	Guiana	27 652 „
New Hebrides	88 000 „	Réunion.	2 471 „
Mayotte and the Comoro Islands	56 056 „		

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(1) In addition to this, 135 tons (1911) of ground cacao from Germany, Holland and Switzerland have been imported. (*Author's note*).

At Guadeloupe all the cacao plantations are to be found at "Basse Terre", where the area which can be used for this purpose is not estimated at more than 6000 or 7500 acres.

At Martinique the cacao was introduced in 1661 by means of seeds from Venezuela. The area suitable for cacao cultivation is estimated here at above 7400 acres.

The first serious attempts at growing cacao in the French Congo date from 1887 (the creation of the Libreville Experimental Garden); the first plantations were made in 1889. The latter have developed particularly on the coast zone and especially at Gabon in the district of Libreville.

At Mayotte and its dependencies this cultivation is of recent origin.

The only part of Madagascar where cacao trees have any chance of development is the coast district, approximately from Vohémar in the north and Mahanoro or Mananjary in the south. At the present time, the Madagascar cacao comes in the first place from the Tamatave district and secondly from the districts of Andevoranto, Vatomandry and Mahamoro. The first exportations were in 1896.

On the Ivory Coast, attention is beginning to be paid to the cultivation of the cacao tree. The first export of the products took place in 1900; and the excellent quality of this cacao was proved by industrial tests made in 1912 under the supervision of the Colonial Garden (*Bulletin du Jardin Colonial*, No. 108. March 1912).

Although the cacao tree has been found growing wild in certain parts of Guiana, where the climate as well as the soil are very suitable to its requirements, this tree has never been grown in the colony to any extent. It appears that this is due for the most part to the scarcity and cost of labour.

Cacao production might be a source of revenue to Cochin-China, Cambodia and South Annam, but so far the tree has only been grown experimentally in these countries.

371 – New Species of Shade Trees for Cacao, Vanilla and Coffee Plants.

CHEVALIER, A. Nouveaux Arbres d'Ombrage pour les Cacaoyers, la Vanille et les Caféiers. — *Journal d'Agriculture Tropicale*, Year 13, No. 139, pp. 27-29. Paris, January 31, 1913.

The writer mentions *Rauwolfia vomitoria* Afz., which the colonists of Gabon use to shade their cacao plantations and which he saw employed for the same purpose in the vanilla plantations in the neighbourhood of Libreville.

Rauwolfia is a small tree with a straight trunk and belongs to the Apocynaceae; it is from 16 to 26 ft. high and forms a spreading canopy. The leaves give a fair amount of shade and remain on the tree throughout the dry season. The tree can be multiplied by seeds and by cuttings using in the latter case large branches during the rainy season. The roots do not exhaust the soil and cacao trees growing quite close to these trees do not suffer in any way from their proximity.

Another shade tree grown in the Belgian Congo to protect the coffee plantations, *Eucalyptus robustus*, is recommended by the writer for Dahomey, French Guinea, South Sudan, and the Brazzaville district.

This tree not only flourishes in irrigated soil, or where the ground is damp throughout the year, but it grows also on dry plateaux occupied by the savannah type of vegetation.

At the Jesuit Mission Station of Kisartre, coffee plants have been grown under the shelter of *Eucalyptus* trees some tens years old and already 50 to 65 feet high, with a very straight trunk. These trees are vigorous, covered with fruit and free from cryptogamic disease; they are planted from 50 to 60 feet apart, while a space of 13 feet is left between the coffee plants. The latter, which for the most part belong to the species cultivated in Africa, have adapted themselves perfectly to this association.

372 - **Growing *Chrysanthemum (Pyrethrum) cinerariæfolium.***

SLAUS-KANTSCHIEDER, JOH. Ueber Chrysanthemum (Pyrethrum) cinerariaefolium (die Insektenblüte). (Mitteilungen des Komitees zur staatlichen Förderung der Kultur von Arzneipflanzen in Oesterreich Nr. 12). — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XIV, Part I, pp. 1-8. Vienna, January 1913.

Investigations hitherto conducted on the chemical composition of pyrethrum powder and on its active insecticidal principle; cultivation, crop accounts, yield; preparation of the pyrethrum powder, its adulterations and means of detection; trade.

Chrysanthemum cinerariaefolium grows wild on the stony slopes of Montenegro and Dalmatia up to 3 300 feet above sea level. It is also cultivated in these two countries, in Bosnia Herzegovina and for the last ten years in the Quarnero islands. The greatest portion of the Dalmatian pyrethrum is yielded by cultivated plants which differ from the wild ones by their somewhat larger flowers. Insecticide powders are also prepared from *Pyrethrum roseum* and *P. carneum*, which grow wild in the Caucasian region and are erroneously called Persian insecticides.

The cultivation of these three species has been repeatedly attempted in Italy, France, Algeria and California, but hitherto these countries have not placed on the market any considerable quantity of the drug.

Cultivation of Chrysanthemum cinerariaefolium. — In Dalmatia this species is grown continuously or temporarily; the former system is mostly practised in the neighbourhood of Sebenico, Traù and on the island of Lesina; the latter all over the country, in old vineyards, or old olive groves or in plots that are to be planted to vines.

It is sown usually about the end of March, the seed being covered with ½ to 1 centimetre (0.2 to 0.4 inch.) of fine earth and then with dry leaves. Possibly seed from the wild mountain plants is used as it has been observed that the species degenerates under cultivation. The seed bed requires fairly rich, soft soil, preferably with a southern aspect. Subsequent interculture consists in weeding and eventually irrigation during the summer months. As the autumn is mild, sowing is sometimes done at the beginning of September and the seedlings planted out in the succeeding spring. On average only about half the seeds give rise to plants fit to be planted out in the month of March. The soil devoted to this plant may be very calcareous or marly, and it must have a southern aspect. It is prepared in the preceding autumn, being arranged in furrows 16 inches deep. The seedlings are set out in rows and 16 × 20 inches apart; of every hundred plants set out, 15 to 30 perish and have to be replaced. Flowering begins at the end of May of the same year, but it reaches its maximum only in the third year. During the summer the plants are hoed lightly once or twice. In the second half of May, or if the weather is wet, in June collecting the flowers begins. The buds are paid better. An adult can gather in one day the flowers from 1 500 to 2 500 plants. 100 flowers weigh on average 1 $^3/_4$ oz.; one plant produces 80 to 150 flowers; 100 lbs. of fresh flowers yield 25 to 33 lbs. of dried flowers. In Dalmatia the flowers are dried in the shade in layers 1.2 or 1.6 inches deep spread on cloths stretched on frames. The layers are turned over two or three times a day. The "persian" flowers are first dried in the sun and then in the shade. When the harvest is over the plants are mowed, the ground is hoed in the autumn and again in spring.

The area devoted to this culture in Dalmatia varies very considerably, but it may be set down at 1 700 acres, of which one half is under continuous cultivation. The average yearly production of Dalmatia during the last five years was from 1 500 000 lbs to 2 205 000 lbs of dry flowers; the yearly production of the Quarnero isles is between 330 000 and 440 000 lbs. The average prices during the last five years: Dalmatian flowers, open, 6 ½*d* per lb., still in the bud 10 $^3/_4$ *d* per lb. Montenegro flowers (wild) 1*d* to 1 $^3/_4$ *d* per lb. dearer than the Dalmatian flowers. "Persian" flowers 1*s* to 1*s* 0 ½*d*. The prices are however subject to great variations; they were for instance 2*d* per lb. in 1883 and 1*s* 8 ½*d* per lb. in 1893.

As for returns, the growing of pyrethrum follows closely that of the vine. It further allows the profitable cultivation of soils which would not be suitable for any other crops. The average time that the plants last is 6 years; some attain even the age of 20.

Accounts of pyrethrum growing on 1 acre.

	£	*s*	*d*
Preparation of the soil, sowing, and setting out . .	47	3	6
Winter and spring hoeing, two summer hoeings, harvesting, carriage and esiccation of the flowers, mowing the stems £ 12 16 *s* 1 *d* per annum for 6 years	76	16	6
Total cost of six crops . . £	124	0	0
Yield: 803 lbs. of dry flowers per acre per year, at an average price of 8.16 *d* per pound . . . £	163	16 *s*	3 *d*

From the difference between outlay and returns, interest on capital and taxes have to be deducted.

The dried flowers are ground to powder at Triest (10 mills), Sebenico, Zara, Ragusa, etc. The principal market of the product is Triest, which sells fully two-thirds of the production of Dalmatia.

373 - *Carludovica palmata* in Brazil.

A palmeira dos chapeus de Chile e Panamá (*Carludovica palmata*). — *Chacaras e Quintaes*, Vol. VII, No. 1, p. 24. Sao Paulo, Brazil, January 15, 1913.

Carludovica palmata is native to Central America, Brazil, Perù and Chile. In Brazil, where it is called "bambonassa", it covers great extents of land; but it is not industrially utilized, The isolaled ribs of young leaves, softened in boiling water, then passed successively into a solution of citric acid and into cold water. after which they are dried, are the material from which the real Panama hats are made. In 1853 and again in 1867 attempts were made to introduce this industry into Brazil; but both failed. The writer insists upon the possibility and on the advantages of another trial.

The province of Moyobamba in Peru is one of the principal centres of the manufacture of Panama hats, which are exported also to Brazil.

374 - Some New Kitchen Garden Plants for 1913.

MARKET GARDENING

GARNIER, MAX. Quelques plantes nouvelles pour 1913. — *Revue Horticole*, Year 83, Nos. 3 and 4, pp. 68-71 and 93-95. Paris, February 1 and 16, 1913.

Early Copenhagen Cabbage. — This vegetable is of Danish origin and superior to most of the early varieties of cabbage in the regularity and size of its large head, which is surrounded by relatively short exterior leaves, few in number. The head keeps for a long time without opening, which is usually not the case with other early cabbages.

Brussels Sprouts, Merveille des Marchés. — An excellent variety and a great improvement on the Demi-nain de la Halle. Grows erect and its height does not exceed 2 feet. The small, almost spherical sprouts are extremely hard and smooth; they grow in large numbers in the axils of the leaves and together form a long compact pyramid.

Dwarf Haricot Bean with variegated seeds. — A true dwarf, very productive and hardy. This bean is classed among the early varieties and is excellent for cooking green as "French beans" The pods are numerous and long, often attaining 8 inches; they are of a bright, light green and contain 7 or 8 beans, which are elongated, half black and half white.

Dwarf Butter Beans, Hundred for One. — These resemble in the shape and colour of their beans the Yellow Hundred for One haricot; this new, half-early variety is to be recommended, as much for its good quality as for its productiveness. The fine, yellow, slightly curved pods are tender, fleshy and of an excellent flavour. This bean is vigorous, strong, and hardy and is equally suitable for field culture and for the amateur's kitchen garden.

Runner Bean without fibres (climbing). — This variety attains a height of over 6ft.; it is strong, full of leaf, light green, and towards the end of the summer, bears fine pods, green when first cut, but deeply tinged with brick red shortly before ripening. The pods are very thick, fleshy and brittle, being entirely without fibres ; they contain 6 to 7 round, pale yellow beans, with a slight brown ring round the hilum.

Red Globe Onion. — This onion is perfectly round, of average size with a very thin collar ; the external envelope is of a fine crimson. The flesh is firm and tinged with pink, the flavour very delicate. It ought to do well in all climates, being fairly early, hardy, easy to grow and keeping well.

Red half-short cylindrical Carrot for forcing. — This vegetable has been especially selected with the view of obtaining a larger crop, while retaining the precocity, light foliage, and qualities necessary in early vegetables. The roots are 2 to 2 ½ inches long and about half this in width. They are absolutely coreless.

Curly Extra Blonde Lettuce. — Somewhat similar to Blonde Géante, but of a more golden colour, the edges of the leaves being more wavy and curled. Its chief advantage is the long time which its very large and firm head lasts. It is very drought-resistant.

Blonde Monstreuse Slow-growing Sorrel. — The result of rigorous selection from the Très Large de Lyon variety, and remarkable for the great size of its very light-coloured leaves ; these are nearly 12 inches long by 8 in. width at the base. This improved sorrel runs up to seed very slowly ; it is extremely productive, and will be unrivalled for market gardens and private garden cultivation.

Invincible Tomato. — A very early, and productive variety with smooth round fruits of a fine red colour.

The plant is of medium height, with light foliage, which does not intercept the sun's rays.

Ruby Tomato. — Fruits spherical of medium size ; skin bright scarlet quite smooth ; very heavy, with very firm flesh. This plant is strong, productive, and has somewhat thickset foliage. Almost as early as the reputed very early varieties, this tomato has the great advantage of a much larger yield.

375 - Artificial Truffle Grounds.

PRADEL. Truffières artificielles. — *La Vie Agricole et Rurale*, Year 2, No. 12, pp. 346-348. Paris, February 1913.

As a check to the deforestation which is taking place everywhere and is accompanied by danger of all kinds, the writer suggests the planting of truffle oaks wherever the nature of the soil permits, and mentions the principal factors which he has found, during thirty years of practical experience, to be necessary for the creation of artificial truffle grounds.

Climate. — A temperate climate is one of the first requisites, and while that of Périgord is particularly favourable to truffle production, still according to Mr. Chatin, there are 53 departments of France in which these fungi are grown.

Altitude and aspect. — A southern aspect is the best, but excellent truffles can be obtained with a northerly one. The best land is moderately hilly and between 100 and 600 m. (300 and 2 000 ft.) above sea-level.

Soil. — Marly soils (socalled oolitic), more or less ferruginous and with a permeable sub-soil are the most suitable. The essentials are that the soil should be light, porous and fairly rich in humus, and that the subsoil should allow the rain-water to drain away. The ideal would be a stratified rock sufficiently compact to hinder the penetration of the taproots of the truffle-bearing tree and at the same time containing enough fissures to permit of the passage of water. This type of rock promotes the development of the spreading roots on which the mycelium grows and bears the truffles.

Where truffles are found growing wild, it is certain that the soil is suitable for their production and the "true black truffle-bearing oak of Périgord" can at once be planted.

Trees. — The hazel, juniper, chestnut, pine, etc., have been mentioned as producing truffles, but the common oak and *Quercus nigra* (1) alone are of any value: only these produce really black highly flavoured truffles (*Tuber melanosporum*).

In order to multiply these suitable trees it is necessary always to sow the acorns in nurseries, for trees raised from seed and not transplanted rarely produce truffles, because they only possess a tap-root, and this grows at the expense of the lateral roots to which the truffle mycelium eventually attaches itself.

Preparation of the Soil. — Ploughing is done in the autumn before' planting out, or if the ground is difficult to work holes of 16 inches in each dimension are made. As a general rule, it may be said that close planting hastens the formation of truffle grounds, but they do not last so' long. It is therefore recommended to plant in rows 16 to 20 ft. apart, with 6ft. 6 in. between the trees; this gives about 320 trees per acre. It is well to grow vines between the rows (preferably direct bearers) or sainfoin, etc., as the presence of these plants promotes the development of truffles.

The work necessary before the time of the growth of the fungi, consists of a simple spring ploughing of the plantation; when the truffles begin to grow, the soil should be worked lightly with a two-pronged hoe in such a manner as not to disturb the truffle bed, which consists of a stratum of hard and compact soil, while the layer above is light and friable (terre de brûlure), having been altered by the action of the mycelium. One acre of uncultivated land if converted into a truffle ground gives an annual revenue of £12 to £13.

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(1) Probably *Q. nigra* Thore, = *Q. Toza* Gillet. (*Ed.*).

FRUIT-GROWING

376 – A New Method of Pruning Young Vines.

VILLEPIGNE, R. Une nouvelle taille des jeunes plants de Vigne — *La Vie Agricole et Rurale*, Year 2, No. 10, pp. 283-284, fig. Paris, February 8, 1913

The writer being struck with the gaps which occur annually in the vineyards and the dangers incurred by the year-old rooted grafts usually employed to replace the missing vines, suggests that recourse should be had to rooted grafts which have already been two years in the nursery, treating them as follows:

After the first season in the nursery, they should be cut immediately below the unripened wood (no attention being paid to the fragility of the internodes), and all the buds situated below the upper three or four eyes must be nipped off.

During the second year that the graft is in the nursery, these three buds, or any way two of them, develop and after the second season these two shoots, each pruned to four or five eyes, will give rise to two branches at a suitable height.

The vine is then replanted with all its roots in the vacant hole and its branches are bent and at once tied at the required height. The buds which need care are thus at the same height as the neighbouring branches and cannot escape the notice of the labourer.

These substitutes bear grapes from the first year of planting and the writer has found 80 to 100 per cent. successful; thus he is much pleased with this method, which allows of a vacant space being at once filled, or of a weak vine being removed and replaced by a young productive plant.

M. Villepigue is the owner of substituted vines, and even of whole vineyards, planted in this way and dating from 1907; he declares that the fear of the plants dying from bearing fruit too young is quite unfounded and that the parts of his vineyard which he has thus replanted are the most flourishing and productive.

377 – Research on Grapes Without Pips.

MANARESI ANGELO. Ricerche sulle uve senza semi. — *L'Agricoltura Bolognese*, Year VI, No. 11, pp. 165-168 and Year VII, No. 1, pp. 1-4. Bologna, November 1912 and January 1913.

The development of pipless grapes (with the exception of sultanas and currants only takes place under certain circumstances. When immediately, after flowering, the fertilized ovules of a bunch are involved in a struggle for existence with unfertilized ovules, the possibility of the development of the latter depends almost exclusively on:

a) Primarily, the variety of vine.

b) The nutritive substances. "In a bunch with many fertilized flowers, the unfertilized are so much at a disadvantage in the struggle for obtaining the nutritive substances present, that they fall off without developing, while if the number of fertilized flowers is small, the unfertilized ones persist and produce pipless grapes." (Müller-Thurgau). Nevertheless this statement must not be taken too literally, since in many varieties the bunches always contain a few grapes without pips.

c) Finally, Müller-Thurgau, basing his theory on observations made on pears considers that the stimulus of the growth of the pollen tube may give rise, in the absence of opposing circumstances, to the development of an ovary into a grape without pips.

The number of such pipless fruits on the same vine varies from year to year, as it depends upon unfavourable conditions of pollination and fertilization, which by hindering the formation of grapes containing many pips, leave more nutritive substances at the disposal of the unfertilized flowers which give rise to pipless grapes.

As Müller-Thurgau has shown, in the case of Swiss grapes, the higher content of hydrocarbons and of other organic substances existing in stocks which have been ringed, favours the development of pipless grapes, not at the cost, as a rule, of fruit with pips, but from flowers, which otherwise would have fallen.

The writer thought it useful to repeat these experiments on Italian varieties, observing at the same time the effect of ringing upon the produce. His experiments were made on Trebbiano, Alionza, Bottona, and a variety of Albana popularly known as Albanone. These (with the exception of the first), as well as Chasselas Napoléon, Termarina, Querciola, Lambrusco di Sorbara, Gamay, Cabernet Franc, Moscatello, Uva Passerina of Tuscany, etc., always produce alongside of very large grapes furnished with pips, a larger or smaller number of small pipless grapes, which have the peculiarity of ripening some days earlier than the others and which never attain the same sugar content. The relative number of grapes with and without pips is never constant, and it is noticeable that, in bunches where any of the grapes are pipless, the grapes of both kinds (with and without pips) are relatively large; the reverse is the case where pipless grapes are few in number, or completely wanting.

Table I gives the data obtained by examining two vines of Albanone (I, II, III) and one of Moscatello (IV).

TABLE I.

Vine	Bunches with many pipless grapes				Bunches with few pipless grapes			
	Normal grapes		Pipless grapes		Normal grapes		Pipless grapes	
	Number	Average weight gr.	Number	Average weight gr.	Number	Average weight gr.	Number	Average weight gr.
I	103	1.631	772	0.185	214	1.495	52	0.154
II	173	2.110	170	0.165	264	1.580	1	0.140
III	116	2.647	253	0.324	321	2.349	49	0.306
IV	193	2.093	668	0.217	502	1.878	3	0.367

Experiments on ringing (carried out before the flowering) gave the results shown in Table II :

TABLE II.

Vines		Date of Vintage	Ringed vine		Unringed Vine	
			Number of grapes	Average weight of one grape gr.	Number of grapes	Average weight of one grape gr.
« Alionza »	grapes with pips	17-IX	778	3,224	811	3,091
	» without »	»	880	0,551	0	—
« Bottona	» with »	»	343	4,073	744	3,242
	» without »	»	191	0,597	35	0,389
«Albanone» I	» with »	21-IX	692	1,968	689	1,969
	» without »	»	179	0,246	39	0,238
» II	» with »	»	207	2,488	548	1,839
	» without »	»	252	0,286	12	0,333
» III	» with »	»	921	1,947	1009	1,460
	» without »	»	63	0,373	87	0,356
« Trebbiano »	with »	30-IX	1760	2,109	1113	1,803
	» without »	»	0	—	0	—

As is seen, the number of pipless grapes is much larger on the ringed vine (except in the case of Albanone III), which confirms the facts observed by Müller-Thurgau, Sannino, and Tossatti and by the writer himself in 1910. The average weight of the grape, with, or without pips, is also usually greater in the case of ringed vines.

The formation of pipless grapes in the place of normal ones greatly diminishes the production on account of the considerable difference in weight existing between the two. In October 1910, the writer gathered all the bunches (200) produced by three Albanone vines and states that they were divided as follows :

2641 pipless grapes average weight . . . . . 0,187 gr.
3240 grapes with pips » » . . . . . . 2,130 »

The loss of crop is thus very noticeable, all the more as it is a question of young vines which have only just begun bearing.

To prevent this loss, it is necessary to promote pollination, especially cross-pollination, in every possible manner :

a) Growing in the same row varieties in which this phenomenon occurs alternately with others capable of acting as sources of pollen.

b) Artificial pollination is of great assistance in the case of table varieties and especially in greenhouses, but is too costly for cultivation on a large scale.

c) In vineyards, the only possible way of preventing the flowers falling is by repeatedly sulphuring the plants while in flower. According to Pacottet, the agitation of the air produced during this process gives rise to a more intense pollination and this view is confirmed by experiments made by the writer in 1911, as shown in Table III.

TABLE III.

	Ringed vine			Unringed vine		
	Number of bunches	Number of grapes		Number of bunches	Number of grapes	
		with pips	pipless		with pips	pipless
Vine I (not sulphured) .	21	78	1243	19	160	624
» II sulphured . . .	25	219	1616	24	571	210
» III » . . .	13	99	829	26	231	299

The ringing was effected before flowering on the 4th of June; the vines were sulphured on June 21, 23, 25, 27 and 29, and July 2, 4 and 6.

378 - Horticultural Research at Woburn.

PICKERING, S. in *Science Progress*, Nos. 26 and 27, pp. 281-291 and 397-412. London, October 1912 and January 1913.

The Woburn Experimental Fruit Farm was started in 1894 and the results of 17 seasons are now available for discussion. In many cases these are entirely contrary to accepted practice, and in fact experiments which were started with the idea of proving an object lesson in malpractice have forced conclusions in the opposite direction.

I. *Planting*. — Nearly 2 000 trees and bushes have been planted on 20 different soils, and in 8 different counties, with the object of ascertaining the effect of *ramming* the soil while planting, that is to say pounding the soil until it is effectually puddled. An analysis of the results shows that

72 % were favourable to ramming.
17 % " ambiguous.
11 % " unfavourable.

The rammed trees were much more vigorous in every way, and their superiority as measured by increased growth was equal to 50 per cent. on an average. With such a method of planting, some damage must often be done to the roots, and each item of such damage as well as of other supposed bad practice in planting has been the subject of separate experiment. Shortening the roots up to removing one-third of their total length proved beneficial, as also did removing all roots less than 2 mm. in diameter, though loss of vigour has followed the removal of those up to 4 mm. In some cases the roots were bent and even tied in knots, and in others the roots were roughly broken instead of being carefully trimmed, without any detriment to the tree. These somewhat surprising results are quite natural when it is remembered that the life of the tree depends on the formation of new roots and not on the preservation of the old ones, and moreover that the majority of new roots do not even form near the ends of the old ones. In a large number of cases investigated it was found that with apple on paradise stock only 15 per cent. of the new roots were formed within $1/4$ inch of the old root ends, 15 per cent. started from the stem itself, and 70 per cent. started from other parts of the main roots.

With regard to the proper depth for planting this must vary with the nature of the soil and the habit of the plant, but will generally be within 6 to 12 inches below the level of the soil; small variations of say 4 inches either way have been found to be quite immaterial, as the new roots have no difficulty in making their way to the level at which they flourish best. Trenching preparatory to planting has been tried on five different soils and has been shown to have little effect when measured either by the behaviour of the trees or by the alteration in the water and nitrogen content of the soil. The air supply of the roots was limited in some experiments by sinking an iron drum 18 inches deep and 3 feet in diameter around some apple trees, and covering the top 2 inches with cement. After 4 years the trees were apparently unaffected by this treatment. Since then they have rather fallen behind similar trees which were not enclosed, but this is quite possibly due to exhaustion of the limited amount of soil available for their growth and not to lack of aeration.

II *Pruning.* — The importance of "cutting back" *i. e.* removing half or two-thirds of each branch of a young tree when transplanted, was shown by leaving some young apple trees uncut. Their leaves showed a 25 per cent. deficit in size and little or no new wood was formed; but given that this operation was performed before the period of active growth commenced, it might be delayed till April without detriment. With regard to the annual branch pruning three treatments were tried in various plantations: 1) normal, or the removal of $1/3$ of each new shoot; 2) hard, or the removal of $^2/_3$ of each new shoot; 3) no pruning.

The relative sizes were as follows:

	normal	hard pruned	unpruned
After 5 years	100	67	133
» 10 »	100	82	107
» 15 »	100	87	102.2

These results leave no doubt that the less a tree is pruned the larger it becomes. At the same time it was shown that growth as measured by the total production of wood including clippings is least in the hard pruned trees; this deficiency in growth is greater in height and spread than in the girth of the stems. The weight of fruit from unpruned trees was double that from the normally pruned trees and about four times that of the hard pruned, and the increase in crop was not accompanied by a marked reduction in the size of the fruit. Taking an average of 10 years the apples of unpruned trees were 4 per cent. smaller than those of the normally pruned trees, and 18 per cent. smaller than the hard pruned trees.

These results naturally apply only to young trees; with older trees where branch formation is comparatively insignificant, severe pruning caused the production of new wood to be tripled. Having established the principles that the growth of a tree varies inversely with the amount of pruning, it must be borne in mind that the growth of a young tree must also be conditioned so that when it comes into bearing it will carry its crop to greatest advantage, and to this end some pruning will be necessary. Therefore as a general principle it would be advisable to do a certain but decreasing amount of pruning for the first 5 or 6 years after planting, at which time the annual pruning may be reduced to the removal of the few terminal inches of twigs which usually consist of imperfectly ripened wood.

Pruning has been performed in early autumn, in mid-winter including the severest weather, and in spring, without obtaining any appreciable differences, but the results with regard to summer pruning are still somewhat ambiguous. That trees should be pruned to outside buds, also that the cut should be slanting and close to the bud appear to be unimportant details; in fact, with regard to the latter, trees, pruned 2 inches above a bud have always done better than those pruned in the orthodox way, no doubt because the bud is weakened by having the wood cut away so close to it.

With regard to *root pruning*, some trees that were root pruned every 4 years only attained 75 per cent. of the size and 44 per cent. of the produce of the unpruned trees after 15 years; others that were root pruned every two years only attained 35 per cent. of the size and bore an insignificant amount of fruit, and lastly others that were root pruned every year all died before 15 years. Thus, root pruning is shown to be a very severe check on vegetation and should be rarely resorted to, though it may be inevitable in the case of a strong-growing wall tree.

Manuring. — 21 plots each containing 18 dwarf apple trees were divided into three groups: 1) received a normal dressing of manure (12 tons of farmyard manure per acre or its equivalent in artificials); 2) received less than the normal or none; 3) received more than the normal (up to 10 times the artificials and 30 tons of dung).

Even after 17 years, the annual measurement of the leaf size, a triennial measurement of the trees, and the annual records of the value of the crops showed no differences, and the results are the more astonishing as the Woburn soil is not particularly fertile: the layer of good soil is only 7 inches deep and beneath it is a stiff clay subsoil which the roots of the trees penetrate with difficulty. After the first 10 years, one lot of trees was removed, the manurial treatment continued, and farm crops grown, and it was found that with these crops the manures had the ordinary effect which they have on other soils. The experiment with apple trees was also repeated in a very poor sandy soil, and here the effect of manuring was very considerable, showing that the method of experimentation was not in fault.

On the other hand, with bush fruits on the Woburn soil, manures have proved absolutely essential, and dung far superior to artificials except in the case of strawberries.

Measurement of Results. — The total weight of the crop and the average size of the fruit must always be supplemented by data less dependent on seasonal fluctuations; *viz. growth* must be measured. In order to do this when the experiment is a short one, lasting 3 or 4 years, the trees are lifted and weighed. With longer experiments, measurements are made of height, of the spread of the branches, of the girth of the stem or of the length of wood formed during a season, or the relative size of the leaves is determined. The results obtained by these various methods have been compared with each other and with the determinations of dry matter and nitrogen in the leaves. They all show a substantial agreement, though naturally the magnitude of the differences is not the same.

FORESTRY

379 - Australian Mangrove Bark.

COOMBS, F A. and ALCOCK, F. — *Collegium*, No. 514, p. 62+fig 1. Frankfurt a. M, Feb. 1, 1913 — (*Abstract from The Leather World*, 1912, p 850).

The writers discuss the probabilities of a successful starting of a mangrove extract industry in Australia. They mention the difficulties in finding the most suitable places for a centre of such industry, being themselves in favour of Cairn and Cooktown on the Queensland coast. Three different kinds of mangrove bark are distinguished, viz: *Rhizophora mucronata* Lam., *Bruguiera gymnorrhiza* Lam., and *Ceriops Candolleana* Arn. *Rhizophora* is the most important of them, representing fully 75 per cent. of the trees which it would pay to strip; it is characterized by its arched roots above the water growing on the water side of the mud and sand banks, while *Bruguiera* appears to grow best where the banks begin to shelve off to higher and firmer ground. The two are usually known under the name of black mangrove. *Ceriops* is the least common of the three, and does not yield anything like the same amount of bark as *Rhizophora* or *Bruguiera.*

The amount of ross influences considerably the analytical figures obtained, as ross only shews 6 per cent. tannin (average) while the bark contains about 30 per cent. The various mangrove barks have different thicknesses of ross, and *Rhizophora* shews an average percentage of ross of 22.6, *Bruguiera* 37.5 and *Ceriops* 28.8. The analyses of mangrove bark given later are carried out on the bark with the ross on. Barks freed from ross would of course shew distinctly higher figures.

As regards drying of mangrove bark, the writers recommend to collect green bark from the strippers at regular intervals and carry it by boat to a convenient drying centre. 100 lbs. green wet bark yield 66 lbs. (average) of air dry bark of 10.3 per cent. moisture.

It was found that the largest (and oldest) trees carry the stoutest bark with the highest tannin value (see table).

	Rhizophora					*Bruguiera*			*Ceriops*	
Diameter . . . . . . ins.	4	8	10	12	16	5	9	15	1	10
Tannin %	28.2	30.3	34.0	38.6	40.4	25.8	29.8	36.4	25.8	32.4

The tannin figures (official method) of different barks, calculated on 12.5 per cent. moisture, are given in the next table, where a few figures of Paessler on East-African mangrove barks are added for comparison.

	Rhizophora (21 samples)		*Bruguiera* (8 samples)		*Ceriops* (6 samples)		Paessler's
	% tan	% nontans	% tan	% nontans	% tan	% nontans	tannin fig.
Average	23.1	10.6	29.1	9.0	30.5	11.4	36.5
Maximum	40.4	12.7	30.4	11.8	32.4	15.0	35.8
Minimum	28.2	7.7	23.6	7.0	25.8	7.9	25.8

LIVE STOCK AND BREEDING.

380 - Experimental Researches on Liver-fluke (*Fasciola hepatica* L.).

HYGIENE

RAILLIET, MOUSSU and HENRY. Recherches expérimentales sur le développement de la Douve hépatique. — *Comptes Rendus des Séances de l'Académie des Sciences*, No. 1, pp. 95-97. Paris, January 6, 1913.

The writers have made researches on the development of *Fasciola hepatica* L., which have led to results somewhat different from the observations of Messrs. Leuckart and Thomas. The writers introduced into the stomach of a lamb fourteen weeks old, born and reared at Alfort, 18 snails (*Lymnaeus minutus*) which contained rediae; after 52 days, the condition of the animal was as follows:

Flesh flabby, liver somewhat easily disintegrated and injured only on the left side; in the parenchyma of this part of the liver there were canaliculi which contained 10 sexually mature liver-flukes 8 mm. long and 3 mm. broad.

The writers made the same observations in the case of an ox, which was attacked by liver-flukes and had been brought to Alfort, where it was slaughtered 42 days later. Although the development of the parasites was normal, their length was only ⅓ of that of the adult liver flukes. From this fact, the writers conclude that three months are necessary for these parasites to develop within their host and not only six weeks, as was stated by M. Thomas.

As in both cases the flukes were found in the liver parenchyma instead of in the bile ducts, the writers think that the parasites reached the liver from the blood and not by means of the bile-duct. This method of transmission is probable, as the animals which were much attacked by *Fasciola hepatica* suffered from inflammation of the inner membrane of the upper and lower veins of the liver and even of the inferior vena cava. The writers also draw attention to cases in which the liver-fluke has been found in other organs. Messrs. Waldmann and Büchli found these parasites in the liver of sucking calves and M. Frommann even discovered them in the foetus of sheep, in which case the only explanation of their presence was their introduction within the uterus. Experiments made by the writers have shown that the direct entrance of the fluke larvae into the bodies of animals is not possible.

381 - Annual Report of Veterinary Officer Investigating Camel Diseases, for the Year Ending March 31st, 1912.

Lahore, Punjab (India), 1912.

This report deals especially with "Surra" and also mentions the other diseases to which camels are subject.

The occurrence of a thirteenth pair of ribs in camels is spoken of at the conclusion.

382 - A Note on Some Interesting Results Following the Internal Administration of Arsenic in Cancer and Other Diseases of the Foot in Horses.

HOLMES, J. D. E. — *Agricultural Research Institute, Pusa, Bulletin* No. 32. Pusa, 1912.

The writer administered arsenic internally in the control of "Surra" in horses; he found that this remedy had a very satisfactory secondary effect upon four animals, which were suffering from foot cancer, the latter being quickly cured by large doses of arsenic.

383 - Experimental Studies on Contagious Agalactia (Deficiency of Milk) in Goats and Sheep.

MARCA, ROCCO and COCCIANTE, NICOLA. Studi sperimentali sull'Agalassia contagiosa degli ovini e caprini. — *Special reprint from the Giornale della Reale Società Nazionale Veterinaria*, Year LXI. Turin, 1912.

The writers give first a short review of the various works so far published dealing with the contagious agalactia of sheep and goats and then pass on to a detailed account of the disease. The chief symptoms of the latter are fever, alteration of the lacteal glands, joints and eyes of the animals; but, as a rule, the former are alone affected.

The writers were able to produce the malady artificially in healthy sheep by means of sub-cutaneous injections of the blood or milk filtrate taken from diseased animals. Further, they were able to prepare a serum for immunisation against contagious agalactia, which has proved to be very efficient.

384 - The Investigation and Value of Perilla Cake and Mowrah Meal.

FEEDS AND FEEDING

1. — HONCAMP, F., MEICH, M., and ZIMMERMANN, H. Ueber Perillakuchen und Mowramehl. (Mitteilung der landwirtschaftl. Versuchsstation Rostock). — *Die Landwirtschaftlichen Versuchsstationen*, Vol. LXXVIII, Parts V and VI, pp. 321-347 + tables I-IV. Berlin, December 30, 1912.

2. — BREDEMANN, G. Ueber Presskuchen der Perillassat. Mitteilung der landwirtschaftlichen Versuchsstation Harleshausen, Cassel). — *Id.*, pp. 349-365 + tables V-VI.

As is well known, oil cakes are much in request for feeding cattle owing to their high protein content and to the large amount of fats sometimes present. Lately perilla cakes have again made their appearance on the market; these are made from the perilla plant, a Labiate cultivated in China, India, and sub-tropical Japan for the sake of the oil extracted from its seeds. The production of oil is estimated at 110 000 gals. and is especially imported into Japan where it is used as substitute for linseed oil.

Chemical analysis and feeding experiments on Shropshire lambs gave the following results compared with those obtained with meadow hay:

	Substance		Coefficient of digestibility per cent
	In natural state per cent	Dried per cent	
Water	12.30	—	—
Crude protein	36.31	41.40	87.0
Pure albumen	35.20	40.14	—
Nitrogen-free extract	19.71	22.51	48.7
Crude fats	7.05	8.04	87.7
Crude fibre	16.28	18.56	7.0
Ash	8.32	9.40	—
Dry matter	—	—	56.3
Organic matter	—	—	60.4

From the above are obtained:

	Nutritive substances	
	Crude per cent	Digestible per cent
Crude protein	41.40	36.02
Nitrogen-free extract	22.51	10.96
Crude fats	8.04	7.05
Crude fibre	18.56	1.30

On the basis of a nutritive value of 90 % per 100 lbs. we have :

	Digestible albumen lbs.	Starch value lbs.
Dry matter	34.76	53.7
Matter in natural state with 12 % of water	30.56	49

Taking the commercial value of digestible albumen in 1911 (Rostock-Mecklenburg) at 1.29*d* per lb., and that of the starch value at 1.20*d* per lb. we have :

49 × 1.20 = ...	4 s 10.68 *d*
Supplemented by 30.56 of digestible albumen	
at 0.168 *d* per lb.	5.13 »
Total . . .	5 s 3.81 *d*

It must be noted that the prices quoted in 1911 for concentrateds were very high.

Cakes of *Bassia latifolia* Rxb. ("Mowrah") were found on examination to contain in a dry state and free from fat from 29 to 31 per cent. of saponin ; they are therefore to be regarded as poisonous to domestic animals. In fact, even when diluted to 3.2 : 30 000 and 3.4 : 30 000, they have a haemolytic effect on the blood of the latter. Consequently only after they have been freed from saponin and examined in a laboratory can they be used as food. As for the use of Mowrah cakes as a fertilizer, there were found in a ton :

		s.	*d.*
Nitrogen	57.46 lb. at 6.40 *d*	30	7.6
Phosphorus pentoxide	22.52 » » 1.17 »	2	2.3
Potash	76.42 » » 0.64 »	1	0.9
Lime	6.09 » » 0.05 »	0	0.5
		36	11.5

Considering the form in which the nitrogen occurs and the mass of inert substances, Mowrah cakes used as a fertilizer cannot fetch more than about 30 shillings.

Amongst the species of perilla used for the production of oil and cakes the following should be distinguished: *P. ocymoides* L. the most common, *P. arguta* Benth., especially cultivated in Japan, and *P. nankinensis* Dec., especially grown in India. The anatomical and microscopical characters of the three species are given. The reticulated cells occurring in the external layer of the integument are characteristic ; it is, however, very difficult to distinguish cakes made from *P. ocymoides* from *P. arguta* cakes; but this is practically of no importance.

385 – Tomato Seed Cake.

AGUET, JAMES. Un nuovo prodotto per l'alimentazione del bestiame. — *Società degli agricoltori italiani, Bollettino quindicinale*, Year XVIII, No 4, pp. 126-127. Rome. February 28, 1912.

A factory at San Giovanni a Teduccio, near Naples, has commenced the industrial manufacture of tomato-seed cake.

The residues from the tomato-preserving factories, as soon as they are collected and before they have time to ferment, are dried in an exsiccator and then passed through a series of machines which separate the skins from the seeds ; the latter are then ground and from the meal the oil is extracted by hydraulic pressure. The composition of the resulting cake is the following :

Water	10.10	per cent.
Dry matter	89.90	» »
Crude fat	11.63	» »
Crude protein	38.13	» »
Pure protein	33.44	» »
Digestible protein	23.75	» »

In feeding trials conducted at the Royal Higher School of Agriculture at Portici with Schwyz milch-cows, tomato cake proved to possess the same food value as linseed cake.

386 – Method for the Determination of the Amount of Hulls in Cottonseed Meal.

KOLE, C. J. Methode voor de bepaling van het gehalte aan katoenzaadschillen in Katoenzaadmeel. Rijksproefstation voor zaadcontrole (Afdeling Microscopie der Voedermiddelen). — *Departement van Landbouw, Nijverheid en Handel, Directie van den Landbouw, Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstations*, No. XII, pp. 34-47 (46-47). The Hague, 1912.

Lately the hull content of cottonseed meal has been determined by washing with water at the Royal Experiment and Control Station at Wageningen, Holland. The method employed is as follows : 5 gr. of the sample are placed in a tall glass and 300 cc. of boiling water is added. The glass is left standing for a least four hours, and then the fluid is poured off, the sediment being turned out onto a piece of muslin 15 × 15 cm., with 100 µ mesh. The four ends of the muslin are gathered up together and the mass is kneaded with the fingers, in order to break it up. The mass is replaced in the glass and water poured on it. When the hulls have sunk to the bottom, the floating parts are decanted off. Then the glass is again filled with water ; when the heavier hulls lie at the bottom of the glass the superincumbent fluid and the smaller hulls and coarse portions of meal are turned out upon the muslin. Then the mass is placed in a mortar and the lumps are pounded with a pestle covered with india rubber. The mass must be washed once more in the glass, and as soon as the hulls have sunk, the floating parts of the meal are poured off. These operations are continued until all the meal is removed. The remainder, consisting of the hulls, is dried and weighed. The content of hulls determined must be multiplied by the factor $^{100}/_{72}$. This factor has been empirically determined.

The limit of the hull content of cottonseed meal is 15 per cent.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

387 - Stock Breeding in Morocco.

GEOFFROY SAINT HILAIRE. L'Élevage au Maroc. — *La Vie Agricole et Rurale*, Year 2, No. 11, pp. 314-318. Paris, February 15, 1913.

There are important breeds of stock in the north-western part of Morocco; but although the natural conditions are favourable to stock-keeping, the number of animals is relatively small. The reasons for this are: the regulations in force forbidding the export of horses and sheep, carelessness in breeding, and want of security. The writer believes that the number of animals bred could be quadrupled.

I. Horses. — These are only bred for home use; but though no systematic scheme is followed, certain stallions are often preferred to others. In appearance, the horses differ little from the Berber breed. They often have high hocks, their heads are heavy, and their croup is falling, but the chest and lumbar regions are well developed. The writer fears that the few and carelessly bred animals will not suffice for future needs and therefore recommends the establishment of local studs, the improvement of the horses by crossing them with Arab thorough-breds and the rescinding of the order forbidding export.

II. *Mules.* —These are bred almost entirely in the mountain districts. The price of the Moroccan mule, like that of the Algerian, which it much resembles, has greatly increased of late years, having doubled in three years. This fact will doubtless give an impetus to mule-breeding.

III. *Cattle.* — Cattle-keeping is the most important branch of agricultural industry in North-West Morocco. The animals are pure red in colour and have straight faces and lyre-shaped horns, which bend upwards; the horns are light coloured with black tips; the height at the withers averages just on 4 ft. The Moroccan cattle are distinguished for their fine shape; they are good milkers and fatten well, but are also suitable for work. The daily milk yield is from one and a half to two gallons and the carcass weight of animals of 660 lbs. is 50 per cent. of the live weight.

In the opinion of the writer, the Moroccan cattle could be quickly and easily improved.

IV. *Sheep.* — These are nearly related to the Merino breed. Their special characteristics are: heavy fleece, a large dewlap and folded skin; the folds extend over the neck to the shoulders and often even beneath the chest. The face line, in the case of ewes is straight, but it is curved in rams. The face, as well as the upper parts of the legs, is covered with wool; the latter is fine and regular and is much prized as an article of commerce.

As the export of sheep is forbidden, these animals are only kept by the natives for their milk, skins and wool. The writer recommends their being selected, or crossed with "Mérinos de la Crau", in order to improve their fattening properties.

388 - Canadian National Live Stock Records for the Years 1909, 1910 and 1911.

Ottawa, Canada, 1910, 1911 and 1912

Amongst other information, this report contains a list of the Canadian Breeders' Associations, together with a short review of their work, information respecting breeds and the number of breeding animals imported into Canada during the years in question (horses imported in 1911 : 2651; of which 1367 were Clydesdales and 540 Percherons), the regulations for the importing of breeding animals into Canada, and a list of the recognized Canadian and foreign herd-books Lastly, the quarantine regulations for imported animals are also given.

389 - Horse Breeding in Prussia during the Last 25 Years.

HORSES, ASSES AND MULES

VON OETTINGEN Die Pferdezucht Preussens in den letzten 25 Jahren — *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 13, pp 103-105 Berlin, February 12, 1913

In 1888, Prussia imported 87 066 horses and exported 11 596 ; in 1912, the imports were 132 007 and the exports 8 038 head. A decrease in the number of imported horses was brought about by the Stud Master in the case of those breeds which could be bred in the country. This especially affected heavy breeds, of which the importation, thanks to the success of local breeding efforts, has decreased of late years. In 1888, 214 local heavy stallions served 14 649 mares of different breeds. In 1912, 798 local Belgian stallions served 46 392 mares (mostly Belgians). At the same time, the keeping of private stallions has been furthered. While in 1888, but few heavy-bred private stallions were kept, in 1912, 1302 of such animals served 65 671 mares.

Little progress has been made in carriage horse breeding. The writer thinks that the only progress which has been made in this direction has been with trotters ; although this branch of breeding is still in its infancy and is only indirectly supported by the State, it has nevertheless attained good results.

The most difficult task of the Stud Direction was the promotion of breeding horses for the army. The Prussian army requires 11 400 remounts annually ; of these 8 700 are bred in East Prussia. While in 1888, in the provinces which supply these remounts, 1175 local stallions served 65 342 mares, in 1912 the number of the former had risen to 1933 and that of the latter to 115 210. At the same time, the keeping of private stallions was encouraged. The loan of £1433 made to the Breeding Associations in 1888 has since been raised to £8 582.

Further measures for the assistance of breeding army horses are : the establishment of two local studs and the renovation of a third, the formation of three principal studs, the adoption of pedigrees, the selection of stud animals by qualified persons appointed by the State, the granting of prizes to breeders of winners on the race-course, and the raising of the premiums for mares, foals, etc., in the different provinces.

Great success has also been obtained in breeding thorough-breds. This is furthered by the regulations affecting the bookmakers' offices, breeders' prizes, and race-courses.

CATTLE

390 – **Feeding Beef Cattle in Alabama.**

GRAY, DAN T. AND WARD, W. F. — *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* 159, 56 pp. Washington, 1912.

A. — In the first experiment, 60 young steers (2-3 years old) were used. None of them were purebred but all had been graded up by the use of Hereford, Aberdeen-Angus and Shorthorn sires.

The following were the rations given during the fattening time for 84 consecutive days.

Average daily rations for each steer by 28 - day periods.

Period	Lot I: 20 steers			Lot II: 20 steers			Lot III: 20 steers	
	Cotton-seed meal	Cotton-seed hulls	Corn silage	Cotton-seed meal	Cotton-seed hulls	Johnson grass (1) hay	Cotton-seed meal	Cotton-seed hulls
	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs
First 28 days.	4.64	14.88	22.57	4.64	13.58	9.43	4.64	26.53
Second 28 days	6.00	15.27	19.49	6.00	15.11	8.87	6.00	29.43
Third 28 days.	7.73	24.79	—	7.73	14.21	7.03	7.73	23.90

In this experiment, corn silage was used as supplementary feed to the cotton-seed hulls. The average gains in live-weight per day and per steer for the entire period were: Lot I, 1.8 lbs; Lot II, 1.54 lbs; Lot III, 1.71 lbs. Thus Johnson grass proved to be a less satisfactory supplementary feed than corn silage. In Lot I, the steers made the cheapest gains.

B. — Another experiment was made to ascertain whether it paid as well to fatten cattle in the open without any shelter as to fatten them in the cow shed. The cattle used in this test were a mixed lot of 67 animals: steers, heifers and cows. They were divided into two lots. The rations from December 16, 1910 to March 28, 1911 consisted of cottonseed meal and cottonseed hulls. The amount of food used, the live weight attained, the cost of the fodder and the sale price of the cattle are given in tables.

In Lot I (kept under shelter and provided with straw) the unit of live-weight was obtained at a slightly lower cost then in the case of Lot II, which was fattened entirely without shelter.

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1) Johnson grass = *Sorghum halepense.* *(Ed.).*

C. — A third experiment, which was carried out according to the same plan for three consecutive years, was undertaken to ascertain whether it is more profitable to extend the summer fattening thoughout the summer (in which case only a small amount of cottonseed cake, from 2.2 lbs. to 4 lbs. per head and per day is used) or to reduce the time by feeding somewhat larger amounts of cottonseed cake (3.24 lbs. to 5 lbs. per head and per day).

The experiments in all cases proved that the latter method was the more remunerative.

391 - The Influence of the Stage of Lactation on the Composition and Properties of Milk.

ECKLES, C. H. and SHAW, ROSCOE, II.-*U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* 155. Washington, 1913.

The milk of 11 similarly fed cows (3 Jerseys, 3 Holstein-Friesians, 3 Shorthorns and 2 Ayrshires) was tested throughout a whole lactation period and its composition determined. The date of calving, the butter production for every 4 weeks, and throughout the whole lactation period, as well as the production of the other components of the milk during the lactation period are given in tables.

The variations in milk yield and in the content of fat, total of proteins, casein and milk sugar are represented by means of diagrams, which also give the relative size of the fat globules in the milk of the cows of the different breeds.

Information is also given regarding the melting point of the milk fat; the refractive index, the Reichert-Meissl number, etc. The appendix contains the total of the results of weekly analyses of the milk of each cow given separately. A shorter account of these investigations is to be found in *Bulletin No.* 156 *of the U. S. A. Bureau of Animal Industry*, where the differences between the different breeds are especially brought forward.

392 - Royal Jersey Agricultural and Horticultural Society.

Annual Report for 1912. *Jersey*, 1913.

This report contains among others the conditions of the admission of cattle to the Jersey Herdbook, the results of the Butter Tests held by the Society in May and October, a list of the prize-winning animals in 1912 and the lists of prizes for 1913, together with a scale of points for cows and bulls.

393 - The Decline of Commoning (1) Flocks of Sheep in South Germany.

SHEEP

ASSEL, H. Der Rückgang der Gemeindeschäfereien in Süddeutschland. — *Zeitschrift für Schafzucht*, Part 2, pp. 33-37. Hannover, February 1913.

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(1) The sheep of the community graze on undivided communal land (natural meadows) and on the land of the members of the community (arable ground laid down to pasture and meadows). The number of the sheep of each member depends upon the size of his farm. (*Ed.*).

The number of sheep in South Germany has diminished to an extraordinary extent of late years.

This is shown especially clearly by the Bavarian statistics: according to the latter, the number of sheep in Bavaria was:

In 1892	968 414
» 1897	905 916
» 1900	760 428
» 1904	680 099
» 1910	636 321

In June 1907, the sheep on the different farms were divided as follows:

Large farms of over 250 acres	27 599	head
Average and small farms	743 046	»

The continual subdividing of the communal property, chiefly at the request of the small peasant proprietors, and the consequent sacrifice of the common flocks, have led to the general decline of the stock of sheep in South Germany. This result has also been furthered by the more intensive cultivation of the land, over-sea competition, limitation of the market by unfavourable commercial treaties, as well as want of experienced shepherds.

The writer suggests as means of promoting sheep-breeding: more intensive feeding (clover pastures) the reestablishment of courses of instruction for the shepherds, and the retaining of the common grazing lands wherever these are suitable for sheep-breeding.

394 - The Apulian Merino Sheep.

JOSA, G. La pecora merina pugliese. — *Estratto dall'Almanacco dell'Italia agricola, Giornale di Agricoltura per l'anno 1913*, pp. 15 + fig. Piacenza, 1913.

Flocks of Merino sheep were imported into Apulia from Spain, probably from the time of Alfonso I of Aragon; by Murat; and repeatedly by the Bourbons of Naples. The Apulian Merino sheep of today is descended from the flock of the Royal farm "dei tre Santi", which contained in 1860 over 120 000 head and, after the fall of the Bourbons, was sold to some of the large Apulian breeders. These sheep are found on almost the whole of the plains of the Capitanata, *i. e.* the Tavoliere. They are of medium height and their wool is short and fine; they also give meat and milk. The flocks are kept on the nomad system; they graze the Apulian winter pastures from the end of October to the end of May, and the summer pastures of the Abruzzo and Molise mountains for four months. The adult animals obtain all their food from grazing: 16 head to 10 acres in Apulia, and 12 in the mountains. The lambs, during and after weaning, are run on barley or vetches. There are few or no shelters.

Wool.

Average weight of washed fleece *

Lamb 5 months old	2 ¼ lbs	Teg 1-2 years old	5 3/4 lbs.
Ewe	4 to 5 »	Ram	7 3/4 »

Maximum length of wool of fleece:

Absolute: 4 ½ in. (lambs) to in. (selected rams)

Relative 3 ½ in. (4 year-old ewes) to 5 ½ in. (selected rams)

Number of curls	15 to 17 per inch.
Medium diameter of fibres	0.0008 to 0.0010 inch.

* In this operation, the wool loses from 25 to 33 per cent. in weight

Meat.

Average live weight:

Lamb	("vernareccio")	born in November	: at birth 8 3/4 lbs.	: 5 months old,	75 lbs.
»	("cordesco")	» » February	» » 8 lbs.	: 45 days »	30 »
»	("mulacchio")	» » March	» » 9 »	: 30 » »	24 »

Yearling ram	100 lbs.	Ewe teg	60 lbs.
2-year-old ram	130 »	2-year old ewe	75 »
Ram (from 3 to 6 years old)	160 »	Ewe (from 3 to 6 years old)	90 »
Wether	175 »		

Milk.

Production per ewe per day, 1/2 to 3/4 pint.

Production per ewe per annum 12 to 16 gall.

Composition of milk: S. G. 1.0375; fat 7.55; total solids, 19.22 per cent.

The profits are most variable, depending chiefly upon the season. The writer kept an account of the expenses for two successive years: with a capital of £10 587 (2 700 sheep at about 18s each; 1 220 acres of pasture; buildings; circulating capital; live stock; utensils and apparatus for cheese-making) and with £1 249 for expenses (£527 for interest on capital and £722 for the staff, mountain pasturage, etc.), there was in 1909-1910 a gross return of £1 026 and a net return of £ 373; in 1910-11 the gross returns were £ 1 427 and the net returns £ 178.

Thus, the expenses sometimes reach 95 per cent. of the gross returns; at other times the yield may be regarded as satisfactory.

It has been recommended in order to improve the condition of the industry, that the Apulian merinos should be crossed with the Rambouillet breed to obtain early maturity and more mutton. But the hybrid is less hardy and apparently produces less milk. The writer therefore prefers the selection of the present type and counsels improvements in the rearing system (better shelters, less fatigue).

395 - The Merino Sheep of North Africa.

COUTTE, M. Le Mouton Mérinos dans l'Afrique du Nord. — *La Vie Agricole et Rurale*, Year 2, No. 7, pp. 207-211. Paris, January 18, 1913.

The writer estimates the number of sheep in North Africa at about 10 million head. Unfortunately bad management, occasional scarcity of food, entire ignorance of the principles of breeding and other similar causes have prevented sheep-keeping becoming a success. The flocks are very unequal and the results of sheep-keeping are of small value. The extensive and excellent grazing land would permit of an increase in the number of flocks. The writer is of opinion that the mutton production could easily be doubled and the wool production quadrupled, if the following measures were adopted: regulation of the water-supply (arrangements for damming back the water, multiplication of watering places), turfing the ground, making sheds for shelter in bad weather, cultivating cereals or pulse, careful selection of animals used for breeding. The writer considers that of the three breeds of sheep in North Africa (the fat-tailed, Berber, and Arab breeds) the latter, which he believes to be the original of the Merino, could easily be improved. This sheep has a white face; its wool is good, fine, and much prized. The Arab sheep is a good wool-producer and possesses in a latent form all the advantages of the present Merino breed; these latent characteristics would be brought out and increased by mating selected ewes with Merino rams. For this purpose the writer recommends the Rambouillet breed.

POULTRY

396 - A New Method for the Industrial Preservation of Eggs.

DE KEGHEL. Conservation industrielle des œufs. — *Revue de Chimie Industrielle*, Year 24, No. 277, pp. 12-18. Paris, January, 1913.

After rapidly touching upon the subject of the consumption of eggs and the different ways in which eggs are used in industry and as articles of diet, the writer gives a summary of the various processes employed for preserving them. As far as his experimental experience goes, the writer prefers methods based on the use of animal or vegetable fat, and especially those where the eggs are embedded in soft fat in such a way as to exclude all passage of substances from outside. Before the eggs are coated with fat, they should be sterilized with a 0.2 per cent. solution of fluoride of silver. The material for coating is compounded according to the following formula :

Earthnut oil	14	gr
Palm oil	20	»
Coconut oil	16	»
Prepared lard	47	»
Spermaceti	2	»
Trioxymethylene	1	»
Powdered thymol	0.05	»

This mixture prepared over a slow fire acquires, when cold, the consistency of vaseline and is as easy to manipulate. Eggs preserved in this way had the same appearance and taste after 18 months as so-called "new-laid eggs". This system is adopted at a small factory near Ghent, where about 26 000 000 eggs were preserved last year, the work all being done by hand and almost entirely by women The cost price of sufficient mixture to coat 100 eggs is not more than 6*d*, and the preserving cost does not exceed 1*s* 8*d* per 100.

397 - The Poultry Tick.

LAURIE, D. F. *Department of Agriculture of South Australia, Bulletin No. 74* Adelaide, 1912.

The poultry tick (*Argas persicus*, super family *Ixodoidea*, family *Argasidae*) was, according to the writer, introduced into South Australia from India and does much harm in the former country, being the means of transmitting *Spirochaeta Marchouxi* (the causative agent of tick fever). Good results against tick fever have been obtained with salvarsan, but the only radical cure, in the opinion of the writer, is the eradication of the tick. To this end Mr. Laurie has tried various measures and he finds that a 5 or 10 per cent. kerosene emulsion is the best remedy. The ticks are destroyed by one minute's immersion in this liquid; for practical purposes, the spraying, and even soaking, of poultry houses with this emulsion has proved efficacious. Old timber containing many cracks, which serve as shelters to the ticks, should not be used for poultry houses.

The paper deals at length with the life-history of the insect and is illustrated with many good plates. It also gives the regulations in force in South Australia regarding the diseases of poultry.

398 - Sacbrood, a Disease of Bees.

BEES

WHITE, G. F. in *U. S. Department of Agriculture, Bureau of Entomology, Circular No* 169. Washington, 1913.

The writer refers to the works of Howard, Maassen, Burri and Kürsteiner on brood diseases of bees. The last-named investigators found diseased brood free from bacteria in Switzerland. This disease was carefully studied by the writer, who gave it the name of " Sacbrood ". Brown is the most characteristic colour assumed by the infected larva during its decay. Various shades are observed; the term " gray " might sometimes be used to describe the colour. The form of larvae which have succumbed to this disease changes much less than it does in foul brood, and the body wall is, as a rule, not easily broken; thus often the entire larva can by removed intact from the cell. The content of this sack-like larva is more or less watery; the head end is usually turned markedly upwards. There is practically no odour from the brood combs.

In the investigations of the disease, dead and infected larvae were picked from the combs, crushed, and mixed with sterile water. This suspension was filtered in a Berkefeld filter. The filtrate was fed in syrup to six healthy colonies and sacbrood with typical symptoms was produced in all the colonies thus fed. Filtrate from the brood of one of the artificially infected colonies, when fed to two healthy ones, produced sacbrood in each. Other experiments made indicate that the virus is killed by the application of a comparatively small amount of heat. The writer intends publishing a detailed account of his investigations.

FISH

399 - Tape-Worm Disease of Roach and Bream.

WUNDSCH. Die Bandwurmkrankheit der Plotzen und Bleie im Müggelsee, ihre Ausbreitung durch den herbstlichen Vogelzug und ihre Bekämpfung. — *Mitteilungen des Fischerei Vereins für die Provinz Brandenburg*, Vol. II. (New Series), No. 12, pp. 178-183. Berlin, March 1913.

An investigation of the waterfowl which frequent the Müggelsee near Berlin has shown that the strap tape-worm (*Ligula simplicissima*), which is found sexually immature in roach and bream, occurs in large numbers, and with fully developed reproductive organs, in the alimentary canals of Common Gulls (*Larus canus*), Black-headed Gulls (*L. ridibundus*), Goosanders (*Mergus merganser*) and Red-breasted Mergansers (*Mergus serrator*).

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

400 - Comparison of Sources of Mechanical Power in Agriculture (1).

SCHWANECKE, H. K. Vergleich mechanischer Betriebskraft im Landwirtschaftsbetrieb. — *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 3, pp. 95-108. Stuttgart, February 1, 1913.

This paper compares, with the help of diagrams, the most important power machines used in farming, as regards the cost of installing and working them, the space, upkeep and assistance they require, as well as their safety and readiness for use.

The total cost of installation of power machines increases naturally with their size, while at the same time the cost of installation per H. P. diminishes; but the different machines vary considerably in this respect. These differences are shown in the annexed diagrams (figs. 1 and 2). (2)

It will be seen that electric motors require the least cost of installation, next follow combustion motors, then steam engines and lastly wind motors. Within these main lines there are smaller variations which are also clearly shown by the diagrams.

The working expenses include generally interest and amortizement of installation capital, repairs and upkeep of the plant, fuel, lubricants, etc., and wages of engine men. To these must be added smaller sums for the insurance of the plant and attendants, etc. The interest and amortizement are in the main constant annual expenses, and nearly the same whether the machine works much or little, while the other expenses depend mostly upon the greater or less use of the plant. In figs. 3 and 4 the curves show the working expenses for 300 and for 600 hours' work per annum.

As regards the amount of space required, the writer gives the following data: Electric motors require the least space, combustion motors follow, after which steam engines fixed and portable, gas motors and last of

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(1) See No. 829, *B.* May 1912. (*Ed.*).

(2) The Mark is about 0.98 of a shilling; taking it as shilling, each division in fig. 1 represents £100 and in fig. 2 £10. In fig. 3, each division (4 Pf.) represents very nearly one halfpenny. (*Ed.*).

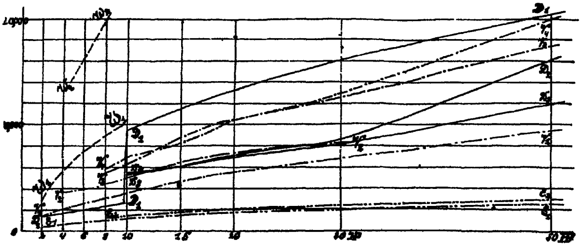

Fig. 1. Total cost of plant in Marks.

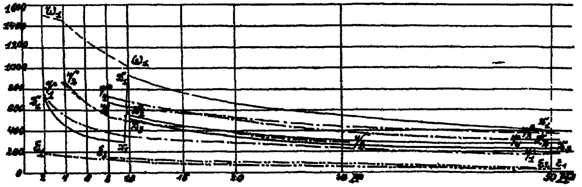

Fig. 2. Cost o plant per H.P. in Marks.

D_1 ——————— D_1 = Steam plant I (common).
D_2 ——————— D_2 = Portable steam engine II.
E —··—··— E = Electromotors.
V_1 —·—·— V_1 = Combustion engines I (stationary).
V_2 —·—·— V_2 = » » II (portable).
V_3 —·—·— V_3 = » » III (crude oil engines).
V_4 —·—·— V_4 = » » IV (gas motors).
W_1 — — — W_1 = Wind mills I (simple).
W_2 — — — W_2 = » » II (electric).

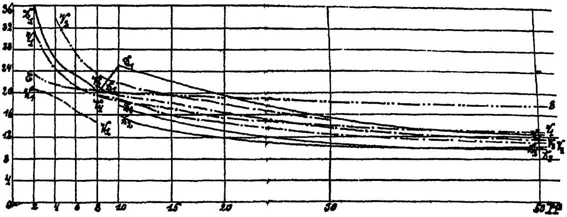

Fig. 3.
Working expenses per H.P./hour in Pfennige.
600 hours.

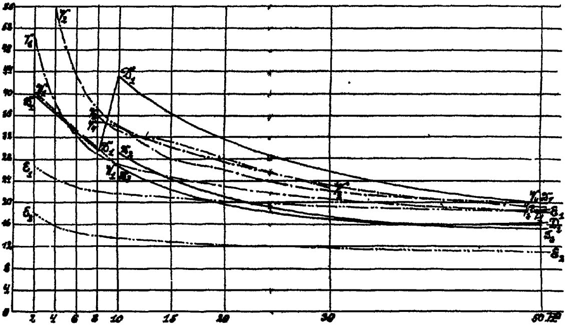

Fig. 4.
Working expenses per H.P./hour in Pfennige.
900 hours.

all the improved steam engines. Wind motors do not as a rule require much space, and local conditions decide as to the advantage of using them.

The smallest demands as to upkeep and attendance are made by electric and wind motors. Combustion motors follow, after which come gas motors and then steam engines.

The greatest safety in working and the greatest durability are afforded by electric motors and in general also by wind motors. Somewhat less favourable are the combustion and gas motors, and least of all the steam engines.

Also as regards the ease and rapidity with which they may be set going, electric motors occupy the first place, followed, in decreasing order of merit, by combustion motors, gas motors and steam engines.

Finally, the writer observes that the choice of the power machine depends very much upon local conditions and that consequently no particular group of motors may be considered absolutely superior to the others.

401 – A New Dynamometer for Steam Ploughs.

REZEK, J. Ueber ein neues Dampfpflug-Dynamometer. — *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule fur Bodenkultur*, Vol. 1, Part 3, pp. 393-406. Vienna, January 15, 1913

The writer draws attention first to the great difficulties which attend the technical investigations on the double engine system of ploughing, in determining the indicated power and that effectively transmitted from the engine to the plough, and then to the unreliable character of the instruments and methods hitherto employed for this object.

After an exhaustive review of the existing dynamometers, the writer describes the solid and durable apparatus he has invented (figs. 1 and 2) and its perfect and reliable working.

This belongs to the group of cylinder and piston instruments. Its cylinder, filled with glycerine, is connected with the draught hook of the plough and the piston with the cable of the working engine. The pressure exerted on the liquid is registered by an indicator, shown in the drawing, on a strip of paper fastened to a drum which is caused to revolve in the same direction by a belt from the axle of the bearing wheels.

This cylinder and piston instrument has the advantage over spring dynamometers in having a rigid non-elastic connection between the motor and the working implement, thus in no way altering the manifestations of the work to be examined. It can besides be built of the necessary dimensions to ensure the required solidity and durability of the instrument, which is not possible with Prof. Giordano's box dynamometer (1), the principle of which requires the sides to be as thin as possible. A further advantage of all cylinder and piston instruments lies in the possibility of using with them steam engine indicators.

While in box dynamometers the deformation of the box is constant, in cylinder and piston instruments there is a cause of error in the friction

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(1) See: GIORDANO FEDERIGO. *Le ricerche sperimentali di meccanica agraria*, p. 132. Milano, 1906. (*Author's note*).

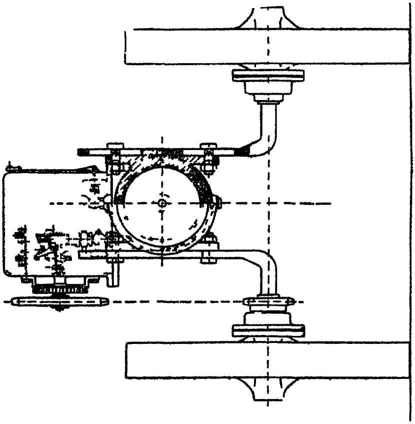


Fig. 2.

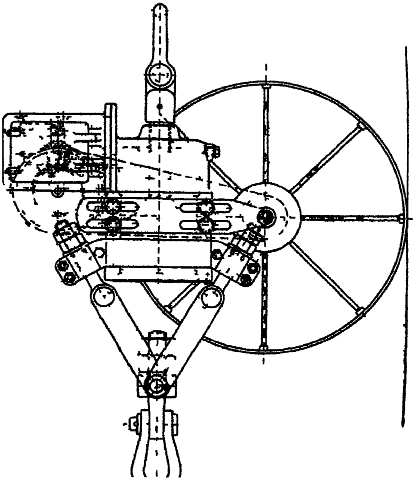


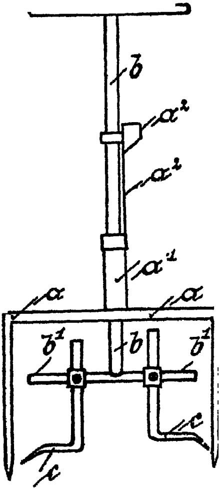
Fig. 1

of the piston in the cylinder, and this has been avoided by the writer in his apparatus by the use of a frictionless piston so arranged as to revolve in the cylinder. A special device to cause it to revolve is not necessary when the dynamometer is used in investigations of steam hauled ploughs, provided it be so situated between the plough and the engine that the cable is connected with the piston instead of with the cylinder. When this condition is fulfilled, the cable, owing to the twist it gets in the making, gives the piston a rotary motion in the cylinder, which begins immediately the cable is taut and continues regularly in the same direction for the whole length of the furrow. The piston moves in the cylinder almost uniformly according to a helicoid line, the pitch of which, though amounting only to a very small fraction of a millimeter, is strictly proportional to the changes in the resistance to traction, because the constant rotary motion of the piston prevents any friction arising.

402 - **Hand Hoe for Beets.**

Handhacken zur Rüben-Kultur. — *Blätter für Zuckerrübenbau*, Year XX, No. 3, pp. 43-44. Berlin, February 15, 1913.

By means of the hoe shown in the annexed figure it is possible to work the soil in a circle all round a beet without damaging it. The implement



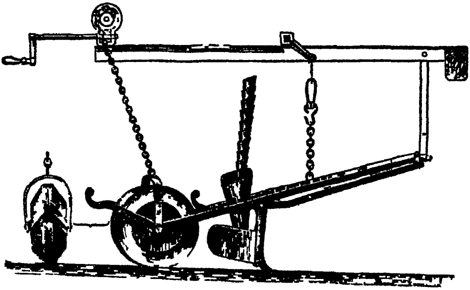
consists of two blades (c, c) fixed at variable distances on the horizontal arms (b^1 b^1) of the vertical handle (b), which goes through a socket (a^1) of the fork (a). The socket is provided with a rod (a^2) which is used to drive the fork into the ground. By shifting the position of the blades plants differing in shape, size and distance apart may be conveniently hoed.

When the tool is placed over a plant and the cross- handle is turned, the blades, pointing in or out according as they have been set, loosen the ground in a circle all round.

403 - The Pracner Drill.

VOGLINO, E. Il metodo Demtschinsky si può applicare anche ai cereali di primavera. — *Il Coltivatore*, Year 59, No. 3, pp. 73-79 + 5 figs. Casalmonferrato, January 30, 1913

The writer, in discussing the Demtschinsky method (1) modified by Zehetmayr for the cultivation of wheat and of other cereals, mentions a new drill suitable for opening the small furrows in which the seed is to remain covered by a layer of slightly compressed earth as is required by the above method. This drill, invented by Zehetmayr, is built by Pracner of Raudniz on Elbe (Austria), after whom it is named.



The writer has seen this drill at work in Apulia in the estate of S. Vito dei Normanni belonging to Prince L. di Frasso-Dentice, who used it also in his estates in Moravia and suggested to the maker some improvements, especially regarding the distance between the furrows, which he wants to be eight inches and upwards so as to allow of horse-hoeing.

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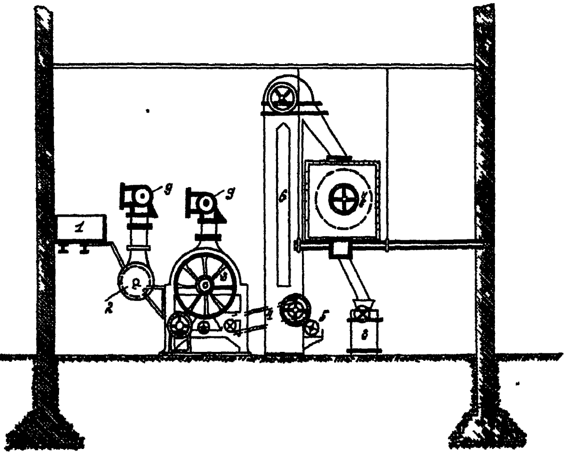
(1) See No. 1708, *B*. June 1911. (*Ed*).



The writer says that the drill in question is an ingeniously contrived and practical machine which resolves very well the problem of sowing in furrows. A small share is attached directly to the seed distributing tube (see fig.) and is followed by a wheel-shaped roller, which, besides compressing the earth about the seeds, which is so useful in dry soils, assists in giving the furrows a proper shape, thus rendering them less liable to be damaged by the rain and bad weather.

With these drills sowing as with the usual drills can be carried out provided they be fitted with the usual coulters.

404 – The Present State of Milk-Drying Technique.

FREUND, EMIL. Der heutige Stand der Milchtrocknungstechnik. — *Monatshefte für Landwirtschaft*, Year 6, Part 1, pp. 16-29. Vienna, January, 1913.

Under the name " Milk-powder " the writer designates the powdery product into which whole or skimmed milk can be transformed. It contains only 12 to 14 per cent. of water; otherwise its chemical composition and taste are the same as those of milk. It appears to dissolve in water without leaving any residue and the solution possesses all the characters of fresh milk.

A great proportion of the methods known for the preparation of milk powder have found but little practical application ; such, for instance, are the processes of the Rhine Food Industry company, Berlin, of the chemical Works " Rhenania " of Aix-la-Chapelle, of Dr. Knoch, Stuttgart, Küpfer and Werthmüller, of John Carnrick of New York and Robert Ellin, Vonkers (U. S. A), of the soup tabloid manufacturers, I. Maggi, etc. Dr. Eckenberg's patented process raised much interest but has not been adopted to any great extent.

The process according to Just Hatmaker's patent is widely spread in America and in France, Germany and neighbouring countries

Dr. Knoch has observed in milk powders made by this method that the albumen loses the power of dissolving and that the fat separates on the surface of the liquid.

A process that has recently appeared is that of the Dry Milk Central Works (Trockenmilchzentrale) Oskar Nicolai, Virsen, Rhineland. The mode of proceeding is the following : Well filtered milk is reduced in a suitable evaporator to a certain volume, after which it passes to the milk drying machine, which in the main consists of a small distributing roller and a large steam-heated drum ; by means of a scraper-like device the white sheet of milk as thick as paper is detached from the drum and laid on a carrier which conveys it to a screw which breaks up the sheet and carries it to an elevator, whence another screw delivers it to an automatic drying apparatus. On leaving this it goes through a screening machine fitted with brushes and sieves from which it issues ready for packing and for sale.

A milk drying plant on this system is shown in the annexed figure, in which : 1, is the milk tank ; 2, preliminary evaporator ; 3, drying drum ;

4, carrier; 5, transport screw; 6, elevator; 7, drying apparatus; 8, screening machine; 9, ventilators.

Similar to Nicolai's process is Gabler Saliter's. The drying, however, is not performed by a current of air but in a vacuum apparatus.

Lastly the Trufood process is to be mentioned; according to this the milk is first concentrated in vacuo and then submitted to the pulverising process.

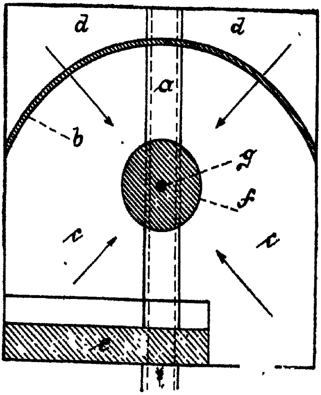
From the above it appears that quite a number of methods for the preparation of milk powder are known. Whether these yield a product which may be pronounced perfect from every point of view is an open question. Anyhow some of the processes produce fairly satisfactory milk powders.

CONSTRUCTION

405 - A Practical Flooring for Pig Styes.

LEISI-GISLER, H. Ein praktischer Schweinestallboden. — *Schweizerische Landwirtschaftliche Zeitschrift*, Year XLI, Part 6, pp. 131-132. Zurich, February 7, 1913.

The basin-shaped floor shown in the annexed figure is 9 ft. 9 in. square with a fall in the centre of about 5 inches. A covered drain (*a*) crosses it throughout its length. An aproximately semicircular concrete or brick rim (*b*) 4 inches wide and 6 in. high, divides the floor into the part for the litter (*c*) and the part for the droppings (*d*). It has been observed that pigs prefer leaving their droppings along the wall furthest from the trough (*e*) where the floor is somewhat higher. This fact has been considered in the arrangements of the present floor. The urine follows the outside of the



rim and falls into the drain without wetting the straw. Another advantage is that the straw, through the movement of the pigs, tends to collect in the lowest part just where the animals like to lie; consequently they always rest on the straw instead of on the bare floor.

For brood sows a wooden disk about 28 inches in diameter (*f*) is fastened to a post (*g*) reaching down from the roof to 12 inches above the lowest part of the floor. Under this disk the suckling pigs can crawl and avoid being crushed by their mother.

RURAL ECONOMICS.

406 - The Limit Value of the Means of Agricultural Production as Basis for the Calculation of the Economical Limit of Outlay.

RURAL ECONOMICS

SCHÖNFELD, LEO. Der Grenzwert der landwirtschaftlichen Productionsmittel als Grundlage für die Berechnung der okonomischen Intensitätsgrenze des Aufwandes. — *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien*, Vol. I, Part 3, pp. 411-441. Vienna, January 15, 1913.

The different portions of the means of production employed have not the same value for agricultural production, for each of them, though they are equal among themselves, is utilized to a different degree. After having reached an optimum production the gross returns, and consequently the utilization and the net returns, for the same-additional outlay begin to diminish, and production at last reaches a point at which the total gross returns do not increase any more by any further addition of outlay. The difference in the utilization of the portions of outlay follows the well-known law of diminishing returns of agricultural production, which is determined by three facts:

1. The production of plants on a given area is limited by the following factors which are limited to the unity of surface: space, light and air, warmth and rainfall; animal production in its turn is limited by the physical dimensions and specific productivity of the organisms.

2. According to Aereboe the character of being present in the minimal proportion may belong at any moment to any one of the factors; for the better or worse utilization of an outlay the frequent favourable coincidence of all the necessary factors of production is decisive. The number of moments however in which plants are in a position to utilize completely a considerable capital of plant food in the soil must be all the smaller the higher this capital is, the more the requirements of plants vary as to the amount and quality of their plant-food during their period of growth and the shorter the latter is.

3. The first portions of the outlay serve to build up and to maintain the substratum of production in the organism of the plant or of the animal and only the subsequent portions of outlay are utilized for transformation into the principal products.

The writer gives a graph of the relationship between the quantities of means of production employed, the limit gross returns, and the total gross returns. The "limit gross return" of the total outlay is the increase of the gross return obtained by the addition of the last portion of outlay. It is to be distinguished from the real gross returns obtained by the single portions of the outlay: while the "limit gross return" in general varies for every portion of the outlay, the real gross returns, or the average gross returns or the portions of general gross returns corresponding to each portion of any outlay, are equal to each other. The "limit gross returns" are used when it is a question of expending or not expending the last portion of an outlay; while the average gross returns serve for the calculation of average utilizations and the like. The writer then gives a mathematical formula showing the relation between the two values, and demonstrates further that the total gross returns may be expressed either as a product of the average gross returns by the number of portions of the outlay, or as the sum of the limit gross returns.

After having introduced the notion of "limit gross returns in cash", he arrives, with the help of integral and differential calculus and on the basis of limit gross returns, to a mathematical expression for the total cash gross returns for a given outlay. He thus shows that the gross returns may be considered as a function of the outlay.

Under "utilization value" (Gebrauchswert) of a means of production, only the cash net returns value is to be understood. This is obtained by subtracting from the increase of the cash gross returns the cost of the greater quantity of means of production used or of the further increased costs of production. It is an error to designate the utilization or the cash gross returns as the "utilization value" of a means of production, as high gross returns and a higher utilization lead to a utilization value of the means of production only when there are net returns. These however depend to a great extent upon the cost of producing the means of production.

Nor can any money value determined indirectly for any non-marketable means of production be called utilization value. From the above it appears that the cash net returns value of a certain quantity of means of production may be directly calculated with correctness by a variation experiment only when the variation is possible without alteration of the other factors which take part in the production. The correct calculation of the cash net returns value of such quantities of means of production, without which there cannot be any production, for instance the total quantity of meadow hay supplied as principal food, is theoretically quite out of the question, as in this case every experiment of variation on the total quantity is impossible. In order to ascertain the limit of intensity only the cash net returns value of those portions which are near the supposed limit of intensity need be calculated. The writer then explains the notion of the "limit cash net returns value" (grenz-geldreinertragswertes), or briefly "limit value", which represents the increase of the cash net returns obtained by the last portion of the outlay, and he calculates this also on the basis of the "limit gross returns."

The limit of intensity can be rigorously established in figures only for means of production the cost of producing which is known. This is not the case with those unmarketable means of production used as the basis of production. With concentrated foods and chemical manures the precise limit of intensity stated in figures plays an important part. The use of a means of production for agricultural produce has reached the economical limit of intensity when it attains that point at which the cash net returns are at a maximum. In order that this should be the case all those portions which still have a positive limit value must have been employed; at the limit of intensity there is the one whose limit value = 0. When therefore it can be ascertained at what stage of the outlay this portion is situated, the limit of intensity will be given. This stage of the outlay is then calculated by the writer by means of the cash gross returns and cash net returns values of the portions of outlay, and in this way he finds a formula for the exact calculation of the economical limit of intensity of the outlay.

Lastly, he determines by means of an experiment of Schneidewind on manuring sugar beets with nitrate of soda, and one of Kellner on milk yields as affected by increasing quantities of fodder, the limits of intensity of the outlay on manures and on concentrated foods respectively, as they result from these variation experiments.

407 – **The Profitableness of Hoed Crops.**

SAGAWE, B. Die Rentabilitat des Hackfruchtbaues. — *Fuhlings Landwirtschaftliche Zeitung*, Year 62, Part 4, pp. 113-128. Stuttgart, February 15, 1913

The writer endeavours to show in this paper that it is possible by means of the inductive statistical method to find the most suitable organization and degree of intensity for the most varied conditions. In order to calculate the intensity of labour in the farm he values the percentage of the acreage devoted to meadows and forage plants at ½, that taken up by grain crops at 1, and that occupied by hoed crops, which are the most exacting, at 3. In this manner he obtains a figure which represents the intensity of cultivation (Anbau-intesitäts-zahl) characterizing a farm (1). He calculated this index number for all the farms he examined, then he arranged the farms according to these indices and observed the results of the farms in connexion with this order. The material for this work was taken from the book-keeping records of the German Agricultural Association (Deutsche Landwirtschaftsgesellschaft) and the Book-keeping Bureau of the chamber of Agriculture of the Province of Silesia. Only those farms were considered in which conditions allowed of a reduction or increase of the area devoted to hoed crops.

A superficial observation of the farms arranged according to the above index shows what far-reaching differences are caused by altered intensity of cultivation (see Table I).

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(1) If for instance 25 per cent. of the total acreage is devoted to meadow and forage crops, 25 per cent. to grain and 50 per cent. to hoed crops, the index number of the intensity of cultivation will be $25 \times \frac{1}{2} + 25 \times 1 + 50 \times 3 = 187\ 5$.

TABLE I.

Number of farms	Index of intensity of cultivation	Total value per acre	Net returns per acre	Gross returns per acre	Interest per cent	Gross returns in percent of value	Net returns in per cent of gross returns
		£ s d	£ s d	£ s d			
Extensive 40	103	28 3 5	15 7	4 3 4	2.76	14.8	18.7
Medium 37	122	28 19 3	1 7 1	5 7 6	4.65	18.5	25.2
Intensive 40.	141	34 6 5	1 13 9	6 10 11	4.91	19.1	25.8

According to the above, the greater economical utility of hoed crops over forage crops in regions in which arable land predominates can hardly be doubted, for with extensive farming (much land under forage crops and meadows) the gross returns are £2 *7s 7d* per acre less than with intensive farming. That these results are not to be attributed to the better conditions of the growth of plants, but chiefly to the increase of intensity, is shown by the figures of the last column but one: £100 worth of property yield with extensive farming only £ 14.8 gross returns, while with medium intensity these reach £ 18.5, and even with an increasing value of property still greater gross returns (19.1 per cent.) have been obtained.

The greater intensity of farming brings also a considerable advantage from the point of view of private economy.

The group of farms under extensive culture bears a quite inadequate interest on the capital engaged, namely 2.76 per cent., while the more intensive group yields upwards of 4 per cent., and the most intensive almost 5 per cent. But the farmer requires also interest on his working capital, at least 6 per cent.

TABLE II.

Group	Outlay per acre	4 per cent interest on value per acre	6 per cent interest on outlay per acre	Total	Net returns per acre	Ratio of interest to net returns
	£ s d	£ s d	s d	£ s d	£ s d	
Extensive.	3 15 9	1 2 7	4 7	1 7 2	15 7	100: 57
Medium	4 10 1	1 3 2	5 5	1 8 7	1 7 1	100: 95
Intensive	5 13 11	1 7 6	6 10	1 14 4	1 13 9	100: 98

The returns of extensively cultivated farms (see Table II) reach but little over one half of the interest required, in the medium group they are not far from it, while in the most intensively farmed groups an almost adequate interest is attained. To this it might be objected that these results are due to the fact that the properties of the extensively cultivated group are valued too high in comparison to those of the other groups. The writer maintains that he is justified in believing that the valuation of the various groups is correct, when the average result of large averages in the various groups is the same. In order to show that such is the case with the material under discussion, he distributed the farms independently of their previous grouping into three groups according to the height of their net returns taken as a basis for the land-tax (Grundsteuer-Reinertrages): *a*) low, *b*) medium, *c*) high net returns as basis for land-tax (see Table III).

TABLE III.

	Net returns basis for land tax	Number of farms	Total value per acre	Net returns per acre	Interest per cent
	s *d*		£ *s* *d*	£ *s* *d*	
a) low	3 11	31	20 12 8	17 1	4.14
b) medium	7 2	34	28 19 3	1 5 9	4.28
c) high	12 9	32	40 1 5	1 12 3	4.02

The range of interest, 0.26 per cent., is so small that it may be completely neglected. A further proof of the reliable nature of the results is in the ratio of net returns to gross returns: in the extensive farms the net returns are less than the fifth part of the gross returns, while with increasing intensity they become more than a quarter of the latter (Table I). The author has also tried to test the trustworthiness of the results by checking the figures according to the rule of probabilities.

He then divides the 117 farms into progressive groups by collecting 41 farms in the first group and then successively removing the first farm from it and adding the one on the list following the last one of the group; he thus obtains a series of 77 groups each of which represents the averages of 41 farms, the first being the group of most extensive farming and the last of the most intensive — Mitscherlich's method. This table also, which shows the progress of development not influenced by arbitrary division into groups, confirms the correctness of the results by the regularity with which interest and gross returns increase with the intensity of cultivation.

In order to make sure that the results can be generalized, the writer discusses from the same point of view the farms connected with the Book-keeping Bureau of the Chamber of Agriculture of the Province of Silesia for 1907-08 and 1910-11. Here also the same facts are observed. The intensively cultivated farms yield 4.88 per cent interest, which is 2.30 per cent. more than that of the extensively cultivated farms. The writer therefore considers that it is not advantageous to organize on extensive lines where intensive culture would be suitable.

A second question arises : Does an intensification of culture in extensive organization promise success? (1).

In order to answer this question a table is given (Table IV) showing the interest yielded by averages of 117 farms, divided within the usual groups of degree of intensity also according to the amount of outlay.

TABLE IV.

	Extensive cultivation			Medium intensive			Intensive cultivation		
	Gross returns per acre	Interest per cent.	Outlay per acre	Gross returns per acre	Interest per cent.	Outlay per acre	Gross returns per acre	Interest per cent.	Outlay per acre
	£ s d		£ s d	£ s d		£ s d	£ s d		£ s d
Low outlay . .	2 18 9	3.98	2 16 0	4 12 6	5.86	3 6 3	5 0 5	6.10	3 9 10
Medium	4 1 9	2.38	3 16 7	4 15 8	3.74	4 2 11	5 16 3	4.40	4 17 3
High	5 11 11	2.10	5 13 6	6 8 7	4.90	6 2 7	8 7 0	4.95	4 16 10

Only those extensively cultivated farms which limited their outlay show a satisfactory rate of interest approaching 4 per cent., while with the increase of the outlay the profits diminish considerably. This effect of increasing expenses is in nowise observed in the more intensively cultivated groups, though here also the farms with the smallest outlays were the most profitable. From the above it is also seen that it is not a question of high gross returns in themselves, but of high gross returns together with the lowest expenses.

In the group of extensively cultivated farms those with a low outlay show in comparison to their gross returns high net returns, which allow them an almost satisfactory rate of interest. But the gross returns in percentage of their value are strikingly low. From the point of view of public economy, these farms perform their duty only very imperfectly. When they attempt to do this better by increasing their expenses, their profitableness suffers (see Table V).

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(1) German economists call intensive culture in extensive organization, the employment of much capital and labour on the crops cultivated; but crops are chosen, which, taken absolutely, require but little capital and labour, as for instance: meadows, forage crops and cereals. (*Ed.*).

TABLE V.

	Extensive		Medium		Intensive	
	Net returns per cent. of gross returns	Gross returns per cent. of value	Net returns per cent. of gross returns	Gross returns per cent. of value	Net returns per cent. of gross returns	Gross returns per cent. of value
Low outlay	33.5	11.9	30.9	18.9	34.9	17.5
Medium „ . . .	14.6	16.3	19 5	19.2	22.5	19.5
High „ . . .	13.2	15.9	25 9	18.9	22.9	19.8

If the extensively cultivated farms are grouped on Mitscherlich's method according to increasing expenses, the rate of interest sinks at once, and from 3.97 per cent. descends to 1.99 per cent. The capability of increasing the crops with extensive organization can therefore only be limited. In order to afford a further proof for this statement a measurement of the total intensity has been made in the three groups of different intensity of cultivation by means of a score in which from one to three points were given to each of the following: Intensity of cultivation, amount of cash outlay, amount of live stock and amount of dead stock. Table VI shows the interest obtained for the various groups.

TABLE VI.

	Low total intensity	Medium total intensity	High total intensity
	per cent.	per cent.	per cent.
Extensive cultivation.	4.27	3.64	2.46
Medium intensive cultivation	3.53	4.44	2.99
Intensive cultivation.	3.96	6.15	5.24

From the above it is seen that extensive cultivation allows only of a low total intensity, that also with medium intensive cultivation the increase of the total intensity is possible and suitable only to a certain degree, as in this case the farms with the highest total intensity yield the insufficient interest of 2.99 per cent., and that only the intensive group affords the greatest play room for the increase of intensity. The motto " Extensive organization with intensive cultivation " is only justified in the sense that in a farm the intensity may be diminished by laying down pastures and the amount of labour and money thus left free be applied to the fields in the form of more intensive working, etc. Forage crops and meadows, even with the most careful farming, do not allow of such an intensive cultivation as hoed crops. The more suitable intensive cultivation is from an economical point of view, the less may the organization be extensive.

The writer next raises the question whether from the above results conclusions may be drawn respecting the most advantageous intensity of cultivation according to the kind of soil. In order to answer this he arranged the farms in the three groups of different degree of intensity accordto the net returns taken as basis for the land tax (Grundsteuer-reinertrag) and according to their total value. The results are shown in Table VII.

TABLE VII.

	Extensively cultivated farms. Interest per cent.	Medium intensively cultivated farms. Interest per cent.	Intensively cultivated farms. Interest per cent.
Low net returns taken as basis for land tax	2.52	4.91	4.98
Medium d.°	2.90	4.48	5.37
High d.°	1.59	5.38	4.38
Low value	3.65	5.06	5.17
High d.°	2.27	4.57	4.80

From the above it is seen that the farms with high net returns taken as basis for the land tax or with a high total value combined with extensive organisation yield a remarably low rate of interest: 1.59 to 2.27 per cent. Consequently the better the soil the less promise of success is held out by extensive organization.

The writer observes that the increase of live stock is no reason for the limitation of hoed crops, as every sugar beet farm where the cultivation of beets is economically advisable, is practically equal to a forage farm for the feeding of cattle, owing to the abundant masses of forage afforded by the beet residues.

In order to test the effect of the increase of intensity upon poor, average and good soils, the farms, in groups according to the intensity of cultivation, are arranged on Mitscherlich's method and show that both on poor and on medium soils the cultivation of plants usual to a more intensive cultivation affords a better interest on the capital employed: 3.10 to 5.37 per cent., and 2.44 to 4.61 per cent. The development in farms with the best soils takes the form of a curve in the following direction: 4.22—4.71—5.05—5.16—4.91—4.67. Here the optimum of intensiveness has probably been passed towards the end of the curve.

In conclusion the writer emphasizes the fact that the superiority of hoed crops, in so far as they are represented by sugar beets, appears in so great a degree only owing to the present prices of sugar, and that with the fall of these it is liable to diminish. On the other hand, the increase in the price of labour will probably be neutralized in the future by a relatively equal increase in the prices of agricultural produce such as cereals and live stock.

408 - Three Years' Returns of the Cooperative Association's Pasture at Kleinmühlingen in Anhalt.

BUTZ, O. Dreijährige Ergebnisse der Genossenschaftsweide Kleinmühlingen in Anhalt.— *Landwirtschaftliche Umschau*, Year 5, No. 7, pp. 133-135. Magdeburg, February 14, 1913.

The Grazing Cooperative Association of Kleinmühlingen, which was established in 1909, rented 29 acres at £3 3*s*. 6*d*. per acre as pasturage for young cattle.

The pasture was divided into three almost equal divisions surrounded by a barbed wire fence and provided with a wooden shelter and drinking troughs. The cost of making the pasture, etc., was as follows:

	£.	s.	d.
1. Making the pasture and compensation for existing crops.	14	4	2½
2. Seed	35	10	5
3. Chemical fertilisers	22	1	3½
4. Fencing	65	14	4½
5. Shelter	22	15	9½
6. Drinking-troughs	—	13	3
7. Wages of artisans	5	11	—
8. Wages of other persons	10	7	8
Total cost	176	18	—

The pasture was used on May 6, 1910, after a crop of grass worth £48 had been taken from one enclosure.

On April 25, 1911, and on April 23, 1912, 1.6 head per acre of young cattle with a live-weight of from 245 lbs. to 267 lbs. per acre, were turned in. The pasture in 1910 furnished 7000 grazing days, or 238 grazing days per acre; in 1911, a year of scarcity, only 5430, or 185 grazing days per acre; in 1912, 7310 or 248 grazing days per acre.

The expenses of the three years work out as follows.

Years' Expenses	1910			1911			1912		
	£.	s.	d.	£.	s.	d.	£.	s.	d.
1. Rent	93	2	0	93	2	0	93	2	0
2. Fertilizers	24	10	0	30	17	5	24	10	0
3. Amortisation of capital expended (10 % on £176 18s.)	17	12	9½	17	12	9½	17	12	9½
4. Interest paid	7	1	1½	6	7	5	5	14	8
5. Wages	2	14	10½	5	14	10½	3	13	6
Total outlay	£145	0	9½	£153	14	6	£144	12	11½
The cost of a day's grazing (allowing for the hay crop of 1910) was thus			3.3*d*			6.69*d*			4.71*d*

409 - Native Labour in Tunis.

CHENEVARD, W. La main-d'oeuvre agricole indigène en Tunisie. — *La Revue des Colons de l'Afrique du Nord*, Year II, No. 7, pp. 103-106. Algiers, February 13, 1913.

The number of native agricultural labourers in Tunis is estimated at 220 000. If the native remains a whole year on the same farm, he receives a monthly wage of from 32*s* to 44*s* according to the district and his age. The day's wage, at ordinary times, is from 1*s* 1 ½*d* to 1*s* 3*d*, but at harvest, it rises to 2*s* or 2*s* 2*d*. On the estates of the native proprietors, the native labourer receives, in addition to his keep, a yearly wage of about £8 to £12. Very varied contracts are made between employer and labourer according as the latter is employed as shepherd and cowman, in the cultivation of cereals, or in growing fruit, this being mostly olives. A shepherd is usually entrusted with a flock of from 100 to 150 sheep and goats ; in the spring, the owner provides him with an assistant. The shepherd's wages are about one tenth of the animals born, about £2 worth of clothing and 6 to 8 cwt. of barley and wheat. He is responsible for all losses which he cannot prove to be due to circumstances beyond his control. The wages of the cattleman are calculated according to the number of animals over one year of age and reach per head per annum, according to the size of the herd and the custom of the district, from 1*s* 6*d* to 6*s* 6*d*.

In the so-called *Khammessa* Contract the labourer (Khammes) takes over from the landowner 20 to 35 acres, according to the fertility of the land, for growing corn. The landowner allows the labourer the use of a pair of oxen, a plough, and the necessary seed-corn, and provides him with all that is required for the support of himself and his family. As wages, the labourer receives the fourth or fifth part of the harvest. It is difficult to reckon the annual earnings of such a man, especially if the terms of the contract permit him during his spare time to work on a neighbouring estate. The writer estimates his annual wages at £16 to £20.

The European colonist sometimes gives the native labourer only half the seed-corn and a helper only at harvest time, so that the latter has to provide his team and plough, or he gives him a small sum of money in adition to everything which is necessary for his work. The labourer now more generally claims half the crop as his share. It is rare for the proprietor to pay by the piece, for in this case the quality of the work suffers.

The work contracts affecting the cultivation of vegetables in the irrigated districts are also very various. If the labourer is given the use of the animals necessary for drawing water and a small sum of money in addittion, he bears all the working expenses and receives, as part of his wages, half the net yield. If the labourer does not enjoy the first two advantages, the landowner has to pay for the hoeing and only receives a quarter of the gross yield. If the owner is able to supervise the market-garden, it is advisable to provide the native with better seed, a complete set of tools and the requisite manure, because the net gain for a capital of £80 to £120 thus laid out, amounts to about £60 to £100.

In the case of the so-called *Mgharsa* Contract, the owner gives the labourer a piece of uncultivated ground on condition that he clears it of bushes and weeds and plants it with s specified kind of fruit-tree (olive, almond, fig, etc.). The labourer receives as wages, when the trees begin to bear, half the fruit crop. If the owner does not wish to appropriate his share, he can make a further contract with the labourer (*Moucakate*), according to which the latter undertakes the further care of the plantation and receives for this two-thirds of the whole crop. If the ground also bears intercalary crops, the labourer receives four-fifths of the produce.

410 - Agricultural Book-keeping in Austria.

1. Sitzung des Zentralkomitees zur Verbreitung der Buchstellenergebnisse. — *Österreichische Agrar-Zeitung*, Year IV, No. 6, p. 65. Vienna, February 8, 1912.
2. POSTELT, A. Wie sollen die Mittel zur Erhaltung der Buchstellen aufgebracht werden? *Ibid.*, pp. 61-63.

Agricultural book-keeping bureaus are at present in operation in the following parts of Austria: Lower Austria, Upper Austria, Styria, Salzburg, Carinthia and Tyrol, also in the district under both sections of the Council of Agriculture (Landeskulturrat) for Bohemia and Moravia (the bureaus in the German section are in course of being established), in the Bohemian portions of Silesia, and in Cracow, Lemberg and in the districts of the Council of Agriculture of the Bukowina. The work of these book-keeping bureaus consists in the accurate keeping of the books of over 1200 estates of different size.

The "Zentralkomitee zur Verarbeitung der Buchstellenergebnisse" in Vienna, which has hitherto only been occupied with establishing new book-keeping bureaus, and working ont uniform regulations for the intercourse between these offices and the farms connected with them, will now turn its attention to working up the data which have been observed in the case of the different estates, their total profitableness and the cost of production, and will consider them under the heads of: Crownlands and their natural spheres of production; the economic position of the farm and its relations to factories; the mutual relations of the parts, *i. e.* whether the various portions are contiguous or scattered; further the chief source of income (cattle breeding or agriculture), the principal crops grown (cereals, roots, fodder, meadow, etc.), the intensity of the farming, the technico-commercial side of the farming and other important points of view.

In this way, it will be possible to bring single cases into their original connection with the whole, and at the same time to obtain an excellent picture of the condition of agriculture throughout Austria.

The principle aim and the *sine qua non* of the success of an agricultural book-keeping bureau is not only to keep correct accounts of every event taking place in the farm, but above all, the power of drawing correct conclusions from the books which enabbes it to give good advice to the farmers so that they can avoid insuccess and obtain the largest possible return from the property under the circumtances.

The 119 members of the Book-keeping Bureau of the German section of the Moravian Landeskulturat send to the bureaus every week a detailed report of all the events of the farm. Three persons are employed in registering and entering these reports.

One person is entrusted with the whole correspondence of the Bureau, two close the accounts and balance the ledgers, while one works up the statistics of all the farms from a politico-commercial standpoint. The last-mentioned, but most important person, is the Head of the Bureau, who after the accounts have been done and the balances struck, reckons the cost of production and draws up the final reports in which the written economic advice is given; he further also visits the different farms and thus keeps in personal touch with the proprietors. The necessary funds for carrying on such a Book-keeping Bureau amount, according to the estimate for 1913, to £392 18*s*.

This sum is apportioned in the following manner:

	£	*s*	*d*
1. Salaries of officials and assistants	254	15	6
2. Cost of actual necessities and of publication	109	16	4
3. Cost of establishing courses of instruction	28	6	2
Total . . .	392	18	0

These expenses are covered by:

	£	*s*	*d*
1. A grant from the Ministry of Agriculture of . . .	83	5	2
2. The local grant of	31	4	5
3 Members' contributions	20	19	7
4 Shares of the State and local grants	257	6	10
Total . . .	392	18	0

The German section of the Moravian Landeskulturrat devotes to the support of its Book-keeping Bureau 3.5 per cent. of all the grants which it receives from the State and the local authorities; and the Minister of Agriculture has recognized the right of using a part of the grants for the maintenance of Book-keeping Bureaus.

In the opinion of the writer, it would be a mistake to offer farmers compensation for the expenses incurred in making the weekly returns; the small trouble entailed by these weekly reports should be fully compensated by a conviction of the great value of accurate book-keeping and by the calculation of the cost of production.

AGRICULTURAL INDUSTRIES.

411 - Extract from the Report of the Swiss Dairy Institute in Berne for the Year 1911.

DAIRYING

BURRI. Aus dem Tätigkeitsbericht der Schweizerischen milchwirtschaftlichen Anstalt Bern für 1913. — *Landwirtschaftliches Jahrbuch der Schweiz* 1912, pp. 469-491. Bern, 1912.

I. *Studies on cheese-making.* — Investigations of the curding process show that, when the time of coagulation is short, the amount of paracasein produced is more than when it is prolonged. The writer now raises the question whether the production could be increased, without detriment to the quality of the cheese, by reducing the coagulation time. Experiments made in order to find an answer to this query prove that the amount of cheese can be increased 0.3 to 0.4 per cent without detracting from the quality of the cheese, if the separation time is reduced by one-third. The writer therefore concludes, that in cases where a firm curd is required, this can be attained by shortening the curding time.

II. *Determination of the solids in milk.* — As the direct determination of the solids in milk is not effected everywhere in the same manner, Dr. Burri made experiments to ascertain which of the methods used produced the best results. These latter were attained by the simplest method, which consists in heating 5 cc. of milk in a flat nickel dish in an ordinary desiccator at 100° C. until it reaches a constant weight.

III. *The effect produced upon the Schardinger reaction by the cooling of milk.* — Several investigators have maintained that the Scharding enzyme adheres to the fat globules. The writer says that, if such is the case, the fact of the fat of the globules in the milk being solid, or in a liquid condition, is possibly not without effect on the enzyme action. This supposition has proved entirely correct as is shown by the following summary of the experimental results.

If the Schardinger reaction is carried out with fresh milk which has been cooled for one hour to at least 10° C., discoloration occurs many minutes sooner than in the case of the same, but uncooled, milk. Cooling down to freezing point produces no further difference. The alteration in milk which is cooled for an hour is detected by the more rapid change of colour on carrying out the Scharding reaction, and can be partially removed if the milk is again heated to about 45° C. immediately on the conclusion of the cooling period. The condition is more stable, however, if two hours are allowed to elapse (reckoned from the beginning of the cooling), before the milk is again heated.

IV. *Experiments in the reducing effect of cows' milk* — The writer maintains that the actual reduction process is hindered, not only by the molecular oxygen above, but also by that present in the reagent; further that on heating milk, reducing substances are produced, which under some circumstances counterfeit others which are absent. In conclusion he states that when milk containing many bacteria and which has not been heated is used, the Scharding reaction at 45° to 50° C gives no conclusive evidence as to the amount of enzyme present, for its reducing effect is masked by bacterial activities in the same direction.

412 - The Alpine Dairy Industry.

Milchwirtschaft auf den Alpen. — *Alpwirtschaftliche Monatsblatter*, Year 47, No. 2, pp. 40-51. Solothurn, February 15, 1913.

A. *Milk yield.* — During the last ten years, the keeping of milch cows has on the whole declined on the Alps, although the number of young cattle there has increased. Thus in 1864, there were in Obwalden, on 202 alps 5 848 cows, while in 1902; there were only 4 166 cows on 290 alps; in 1864 in the Grisons, the number of cows on 596 alps was 28 890 with a milk yield of 2 139 955 gallons and in 1909 the number of cows on 822 alps was only 26 173 and the milk yield 2 364 221 gallons.

The Alpine Statistics for 1911 give the following figures regarding the dairy industry throughout Switzerland: milch cows, 180 564; average grazing time, 91.3 days; total of grazing days, 16 485 493; amount of milk, 25 423 900 gals., thus the milk yield per cow and grazing day is 6.16 quarts, as against 5.30 quarts in 1864. If the goats' milk, 3 269 818 gals., is added to the cows' milk, the total milk yield of 28 693 718 gals., taken at about 7 ½*d* per gals., represents a round sum of £860 000.

B. *Utilization of Milk and Alpine Bookkeeping.* — The writer shows from some examples that wherever bookkeeping is accurately practised in the Alps, the net profit per gallon of milk has greatly increased, for only by an accurate system of bookkeeping, can milk be used in the most remunerative way. While in districts where the old dairy system prevailed, the net price per gallon of milk was from 4 ½*d* to 6*d*, the collective and co-operative dairies with modern conveniences (at Davos a funicular railway has been made for milk transport) obtained a price of 9*d* to 10*d* per gallon.

C. *Dairy products.* — The chief work of the Alpine dairies is the manufacture of whole milk cheeses, skimmed milk cheeses and butter for the market. But in many mountain districts, in spite of the high fat content and rich taste of the Alpine milk, the dairy products are not of first quality. This is often due to the want of a properly instructed staff and the primitive arrangements, apparatus and buildings. Single dairies do not possess the technical means necessary for the production of goods of the best quality. A further evil is that the butter is stored up in the herdsmen's huts and made into cooking butter, which is a cause of much loss to Alpine dairies. The Alpine statistics of the Grisons give the yearly out-put of butter as 693 000 lbs.; of this about two-thirds, *i. e.* 462 000 lbs., is stored and then melted down.

Fresh Alpine butter fetches on an average 1s 2*d*. per lb.; thus the stored butter, if it had been used fresh, would have been worth £26 950. The average value of stored butter in autumn is only 11 ½*d*, so that the

462 000 lbs. are only worth £22 137, which is a loss of £4 813. In addition, the butter loses 5 per cent. on melting and therefore in value, so that the total loss is £6 160.

413 - The Manufacture of Cheeses in the Grisons from Skimmed Cow's Milk and Whole Goat's Milk, and the Utilization of these Milks in Germany.

KRAEMER, H. Zur Frage der Bereitung von Käse aus Kuh-Magermilch und Ziegen-Vollmilch in Graubünden und ihre Nutzanwendung auf deutsche Verhältnisse. (Nach hinterlassenen Manuskripten von Bruun von Neergaards). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Nos. 6, 7 and 9, pp. 84-87, 103–105 and 149-151. Berlin, February and March 1913.

In the Bünden Alps (Switzerland), where the high Alpine pastures with their countless ravines support few cows and many goats, the scanty population and steep Alpine paths make the manufacture of whole milk cheeses a difficult matter during the grazing season; for this reason cheeses are made from skimmed cow's milk and from whole goat's milk.

The writer has investigated to what extent the milk is utilized in these two products, and chose for observation alps with a southern exposure and soil rich in lime. On these were pastured during the grazing season, from June 20 to September 20, 45 cows and about 40 young cattle, with 60 goats; 3120 gals. of cow's milk and 598 gals. of goats milk were made into cheese during this time by the 7 partners. The total gross yield was as follows:

	£	*s*	*d*
1 172.60 lbs. butter	58	1	9
2 589.40 lbs. cheese	44	6	7
499 gals. buttermilk	2	14	0
2 702 gals. whey	4	17	4
Total . . . . £	109	19	8

One gallon of milk therefore produced a gross return of 7.09*d*. If the value of the butter, buttermilk and goat's milk (598 gals × 7.09*d* = £17 14*s* 2*d*) is subtracted, we get the gross return of the skimmed milk; this is £109 19*s* 9*d* — (£58 1*s* 9*d* + £2 14*s* 0*d* + £17 14*s* 2*d*) = £31 9*s* 10*d*.

The gross return of the whole cow's milk is therefore £58 1*s* 9*d* + + £2 14*s* 0*d* + £31 9*s* 10*d* = £92 5*s* 7*d*.

The cost of working it up was 0.56*d* per gallon or £7 6*s* 3*d* for the total cow's milk; thus the sale price of the whole cow's milk was $\frac{£92\ 5s\ 7d\ -\ £7\ 6s\ 3d}{3120} = 6.52d$ per gallon. If the whole milk is to be used in the valley, it fetches thus 6.05*d* per gallon.

The high value of the cow's milk is to be attributed, partly to its high butter content, partly to the increased price of butter in summer and to the increase in the value of the cheese, owing to the admixture of goat's milk. The writer calculates that one gallon of skimmed cow's milk when mixed with goat's milk, is worth about 0.62*d* more, and one gal. of whole cow's milk when mixed with goat's milk is worth about 0.49*d* more than when cow's milk only is used for making skimmed milk cheese.

It is very important for making such cheeses that a certain amount of goat's milk be available, for the cows give most milk at the beginning of the Alpine season, but the goats are not in full milk till 5 or 6 weeks later; therefore in order to make cheeses of equal quality at the beginning of the season it is necessary to add whole cow's milk.

At the end of the Alpine season, as the amount of goat's milk added must be relatively larger and the price of butter has risen, the skimmed milk must have more cream removed.

From these facts, the writer concludes that goat's milk could be used for cheese-making in some parts of Germany. Through employing mixed cow's and goat's milk, the quality of skimmed milk cheese could be improved in Germany, the skimmed milk could be turned to better account, and a large amount of milk protein utilized as a food for the people.

414 - On the Forms Assumed by Phosphorus and Calcium in Milk Casein.

LINDET, L. Sur les formes que le Phosphore et le Calcium affectent dans la Caséine du lait. — *Annales de l'Institut National Agronomique*, Series 2, Vol. XI, Part 2, pp. 213-222. Paris, 1913

These four series of analytic researches aim at showing that a portion only of the phosphorus (about half) occurs as a phosphate, probably tricalcic, while the other enters as phosphoric acid into a combination, which can be hydrolised by alkalis. As for the excess calcium left over from the formation of calcium phosphate, it neutralizes the acidity of the casein, but this neutralization is only partial; for casein can be made to absorb more than 7 per cent. of calcium, in the same manner as it will absorb aluminium, zinc, etc. It is probable that the calcium phosphate is itself broken up by this acidity, for calcium caseinate can be saturated with phosphoric acid without the liquid becoming turbid i. e. without the deposition of the phosphate formed. It is equally possible that calcium phosphate is soluble in calcium caseinate, for the casein precipitated by rennet is entirely soluble, without any deposit of phosphate of lime, in ammonia, or even in concentrated resorcine.

The writer concludes that phosphoric acid and calcium form three groups of mineral elements: 1) calcium combined with the acid hydroxyl; 2) calcium phosphate, probably tricalcic, and 3) phosphoric acid retained by the protein molecule and capable of being detached by hydrolysis or saponification.

The study of the sulphur contained in the casein molecule will be the subject of a further communication.

415 - **The Jerked Beef Industry in Argentina.**

MEAT INDUSTRY

RICHELET, JUAN E. Industria saladeril en la Argentina. — *Boletin del Ministerio de Agricultura*, Vol. XIV, No. 9, pp. 986-1029. Buenos Aires, 1912.

It has often been objected against salted meat that it does not offer sufficient guarantee from a hygienic point of view. According to the writer, nothing can be more erroneous in the case of Argentine meats. In that country the "saladeros" are sumitted to continuous sanitary surveillance; to such an extent that the inspection fees together wth the duty on salt (9s. per ton) and the provincial taxes (4s per head) weigh heavily on the industry and contribute to hinder its full development.

Preparation of " tasajo ". — The animals whose flesh is dried are of the native type (" criollo "), bred in the open and their average live weight is 920 lbs. The amount of dry meat they yield varies from 136 to 235 lbs. The sanitary regulations which govern the industry and which provide very severe penalties against transgressors, allow nothing but salt to be used in the industry. Only Cadiz salt, which is very pure, is used. Of recent years some works have begun to use " mantas " (the muscular mass from the jaws, the neck and the ribs up to the hip bone) for the preparation of dried meat, and " postas " (the mass of muscles freed from bones of each limb, for canned meats and extracts. The animals, after being inspected by the veterinary surgeon, are slaughtered, bled, flayed, and quartered. The " mantas " and the quarters are freed from the excess of fat and cut up into pieces of more or less uniform size. The flesh is sometimes washed, but as a rule it passes at once through one or more (generally three) vats of brine; it is then stacked with salt into heaps about 10 feet high. The stacks are undone every day. The meat is hung in the sun for 7 or 8 hours and the stacks are remade in inverse order. The process lasts from 12 days to a mouth according to the weather. " Tasajo dulce " is not so salty as the other and is dried in an esiccator.

The drying of mutton has also been attempted, but hitherto no method has been found for freeing the meat from its characteristic odour.

In the provinces of Salta and Jujny " Chalona " is prepared; this is dried and salted mutton and it is exported to a great extent to Bolivia.

Prices of dried meat. *

	£	s	d		£	s	d	
For Cuba: « postas » (*f. o. b. Buenos Aires*)	1	1	0	to	2	0	6	per cwt.
» Brazil: « mantas » (*in depot in the Brazilian ports*).	1	15	0	to	3	0	3	»
» » « mantas » and « postas » » »	1	8	6	to	1	16	6	»

* In September 1912 the price at Montevideo was £2 4s 6d per cwt.

Expenses of Importation into Brazil.

	s	d		s	d
Customs duties, per cwt.	6	4	+	11	5
Port dues, per cwt.		2			
Commission, warehousing, per cwt.	4	5			
Total . . .	22s	4d per cwt.			

corresponding to 37s 1d per head (187 lbs. of « tasajo »).

Animals slaughtered for the preparation of dried meat.

Year	Argentina	Uruguay	Brazil	Totals
1891-92	764.400	707.800	485.000	1.957.200
1901-02	454.000	813.400	375.000	1.643.000
1910-11	264.415	698.179	499.500	1.461.794
Yearly Average 1891-1911 .	453.494	783.289	368.816	1.605.589

In 1909, 185 100 head of cattle were slaughtered in the principal Argentine factories for the preparation of meat extracts and preserved meats.

The writer refers to a series of analyses and of digestibility tests (made by Dr. Lavenir and Dr. E. Moreno of Cuba) on the nutritive value of dried meat.

Trade.

Exportation of jerked meat from Argentina.

	Tons	Value £		Tons	Value £
1870-74 . .	166 206	1 324 351	1895-99 . .	175 817	2 789 396
1875-79 . .	165 803	2 312 486	1905-09 . .	62 197	2 070 682
1880-84 . .	114 088	2 886 008	1910. . . .	9 293	204 882
1885-89 . .	159 091	3 954 366	1911. . . .	12 975	—
1890-94 . .	208 457	4 022 445			

The jerked meat industry has been much injured by the rise of the cold stored meat trade, and yet the two industries do not exclude each other, because they utilize different animals and supply different markets. Some of these could absorb still greater quantities of jerked beef, than those actually supplied, while new ones could be opened. Among the first, Brazil is to be mentioned.

In 1912 there were in the State of Rio Grande do Sul, Brazil, 20 "saladeros." They were not, however, sufficient to satisfy the demands of the population of Northern Brazil, whose chief food is jerked beef. In 1906 the production of jerked beef in Rio Grande do Sul was 80 240 559 lbs. In the same year the three States of Para, Pernambuco and Bahia alone consumed 58 364 570 lbs. of this meat. In 1907 the State of Rio Grande do Sul consumed 78 899 014 lbs. of it, or almost the whole local production. In 1908 Brazil consumed 192 951 028 lbs. of jerked beef, whilst the production of Rio Grande do Sul was barely one third of the consumption of the whole country.

The repeated attempts to dry meat in Cuba did not prove successful, owing to the climate being too moist and not warm enough. Similarly all attempts made in Venezuela, in Mexico and in the United States have failed.

Other markets in which jerked beef might be introduced or imported in larger quantities than at present, are the African colonies, Bolivia (which consumed this food up to a short time ago), Peru, Spain, and Portugal) (which might increase considerably their present consumption), and Sweden and Norway (which import salted meats in barrels from the United States), Porto Rico (which has 1 150 000 inhabitants and only 398 000 head of live stock, of which 303 000 are cattle), Jamaica, the Antilles, the Republic of San Domingo, Haiti, etc.

* *

416 - A Method for the Determination of Starch in Meat Food Products.

Price, T. M. *U. S. Department of Agriculture, Bureau of Animal Industry, Circular* 203. Washington, 1912.

The writer gives a short account of the methods hitherto used for determining the amount of starch present in meat products and afterwards gives a detailed description of his own method, which is rapid and sure and can be carried out without the use of an autoclave.

417 - The Sugar Industry in North-East Brazil.

SUGAR INDUSTRY

Serre, Paul. L'industrie sucrière dans le Nord-Est Bresilien. — *Bulletin des Séances de la Société Nationale d'Agriculture de France*, Vol. LXXII, No. 10, pp. 937-949. Paris, December 1912.

The St. Vincent sugar cane was introduced into Brazil shortly after its discovery and notably into the States of Pernambuco (1534) and São Paulo. For a long time, Brazil was the principal sugar-producing country, but it now occupies the sixth place, coming after Cuba, the East Indies, Java, North America and Porto Rico. Cane sugar is made in 15 out of the 21 States of the Federation, the annual production being about 300 000 tons.

From enquiries made by the writer, it appears that there are 86 sugar factories in the six states of North-East Brazil, viz.

Bahia	22	Sergipe	10
Pernambuco	42	Parahyba do Norte	4
Alagoas	6	Rio Grande do Norte	2

There are, further, in the States in question a very large number of "engenhos" (which can be regarded as semi-factories) and "banguês" (of which there are about 1 500 in the State of Pernambuco alone), which make "muscovado" sugar (average extraction 5.5 to 6 per cent.) for local consumption and the market of the interior.

The 22 sugar factories of the State of Bahia are reported to have produced in 1911-1912, 316 992 sacks of white sugar (first and second refinings) of 132 lbs. (60 kg.), of which a large portion (189 726 sacks) has been exported to the different States of Brazil; only 151 sacks have been despatched to foreign ports. The molasses, which are still very rich, are sent to the cooperative distillery of Santo Amaro.

The 6 factories of the State of Alagoas have produced during the same season 188 000 sacks of white sugar, while the output of its 200 "engenhos" is from 400 000; to 450 000 sacks of "muscovado", all in sacks containing 165 lbs. (75 kg.). The four other States have produced approximately:

	Sugar of three qualities				
Pernambuco	1 600 000	sacks	of	75	kg.
Sergipe	65 000	»	»	60	»
Parahyba do Norte	120 090	»	»	75	»
Rio Grande do Norte	50 000	»	»	75	»

According to the statistics of the federal customs, the direct and total exportation of sugar in 1911 amounted to 79 824 820 lbs. (probable value on board £408 506); of this only 680 487 lbs. were white sugar, as against 67 401 tons in 1909. The importation in 1911 was only 609 878 lbs. (probable value on board £6 963).

In 1909 (latest statistics) the total exportations were 151 055 200 lbs. viz:

White sugar (powdered)	933 600	lbs.
» » crystallized	76 900	»
Demerara sugar (N. 13 of the Dutch scale)	76 394 700	»
Muscovado	73 650 000	»

The chief buyers were:

Great Britain	112 492 800	lbs.
Agentina	24 070 500	»
United States	13 275 600	»

Average price per cwt. (taking the milreis at 16 $^1/_5$ *d.*):

	1909.			1908.		
. .	£	*s*	*d*	£	*s*	*d*
White sugar	1	3	5	1	13	6
Demerara		10	10		14	6
Muscovado		9	4		11	5

A tax is put upon exported sugar; this is 1 per cent. in the State of Bahia and 9 per cent. in Pernambuco.

The cultivation factor is always neglected in Brazil. Experiments in cane selection and reproduction by seed were begun, but soon abandoned. Without any system of rotation, without fertilizers or new varieties of canes, the average yield per acre is about 20 tons and, on account of defective methods, 6 per cent. of sugar is obtained from a cane containing double the amount. The yield is 8 to 9 per cent. in Pernambuco and 7 to 8 per cent. in Bahia ; in the former State more brown sugar is made than in the second. In a sugar plantation at Atalaia (State of Alagoas), which was managed scientifically, the cane production reached 32 tons per acre.

On account of the small wages paid to the labourers, (1 400 reis = 1*s* 11*d*. per day), the cost of producing sugar is generally between 1*d* and 1 ½*d* per lb.

As for the industrial factor, it may be said that a modern factory is a very rare thing in North-East Brazil. There are only 3 well appointed factories out of 86. Most of them are old factories done up at small expense and they are usually deficient in up-to-date apparatus. The juice is, as a rule, badly manipulated and no attempt is made to economize fuel.

418 – White Liqueur Wines.

WINE-MAKING

LABORDE, J. Les vins blancs liquoreux. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1000, pp. 233-235. Paris, February 13, 1913.

White liqueur wines are a special kind containing a larger or smaller amount of grape sugar, which has escaped fermentation, and a larger proportion of alcohol than usually occurs in ordinary wines and which is wholly derived from the transformation of the sugar in the original must. The alcoholic content of these wines varies from about 13° to 16°, but this latter figure is often exceeded; therefore the glucometric degree of the must should be higher than 14° Beaumé. It is thanks to two natural occurrences, partial drying and *Botrytis cinerea*, that the grapes are able to become so rich in sugar. The former is used especially in hot countries, where so-called "vins de paille" are produced, these are wines made from grapes that have been partially dried on layers of straw: they are liqueur wines, but their production is very limited.

The great majority of liqueur wines are obtained through the agency of a mould, *Botrytis cinerea*, and they are made in the following districts: Sauternes and the neighbouring districts on the two banks of the Garonne, the hills of Monbazillac in the Bergerac district, certain parts of Anjou (the Layon valley and the district of Saumur), and finally in Germany, in the Palatinate and on the banks of the Rhine and the Moselle.

In order that *Botrytis cinerea* may have a favourable effect on the grapes its presence must be attended by the following circumstances:

1. A temperature a little above the ordinary, a sufficient degree of moisture, but the damp must not be continuous *i. e.* the rainy periods should be followed by longer periods of fine weather.

2. The grapes must be the fruit of selected vines and have fairly resistant skins and very sweet juice; in the Bordeaux and Bergerac districts these conditions are fulfilled by the Sémillon and Sauvignon va-

rieties, in Anjou by Chenin Blanc, and in Germany by Riesling and Traminer.

3. The wines should be grown in somewhat dry soils with an exposure favourable to early ripening; the attacks of the parasite are then restrained, but if the fungus occurs on unripe grapes, the disease is more severe and gives rise to grey rot, which is always fatal.

Grapes attacked by *Botrytis* soon die and have a tendency to dry if external conditions permit. As the crop is successively invaded, it is possible to find on the same vine: 1) healthy grapes, with golden, brilliant, smooth skins; 2) those which are completely rotten, with smooth, but brown and dull skins and which do not bear the external parts of the fungus; 3) grapes which are burnt up ("*rotis*") *i. e.* wrinkled and shrivelled by partial desiccation, and bearing more or less abundant tufts of mould, though the latter are sometimes absent, as in the September attacks, when the temperature is higher and the weather drier than it is in October.

The vintage begins as soon as a certain number of burnt-up grapes make their appearance; the berries are gathered one by one at first; when the rot spreads, portions of the bunch are taken, but the whole crop is not gathered until after 7 or 8 successive pickings. The vintage is pressed as it is gathered; the operation is always difficult on account of the viscous consistency of the rotten grapes and the concentration of their juice. The density and colour of the must derived from the same pomace increases with pressing, so that it is necessary to equalise the must obtained.

The musts are classed as "head", "centre" and "tail" must, and their quality, generally speaking, is in a descending order; the corresponding wines are designated in the same manner. Frequently in the Gironde district the concentration of "head" wines may be from 350 to 500 gr. per litre, or from 14 to 30° Beaumé; in the other *Botrytis* regions such a high sugar content is much more exceptional, and in order to obtain it, the vintage must be prolonged sometimes as late as December.

The physical effect of the *Botrytis* rot is accompanied by physiological changes; these are shown by a relatively high consumption of acidity, which allows, by natural concentration, of a considerable increase in the amount of sugar present without the acidity exceeding its normal limits. Different secretions are also formed: thus a large amount of glycerine is produced, which increases the oiliness of the wine; also mucilaginous substances, which, though they are for the most part eliminated, still leave certain residues giving mellowness to the wine; and finally a large amount of oxydase, the effects of which have to be neutralized by energetic treatment with sulphurous acid.

The fermentation is very slow and in the Bordeaux district only finishes in January or February. At this time the wine is drawn off and treated with sulphurous acid fumes to prevent any continuance of fermentation due to a rise in temperature, which would be injurious to the quality of the wine, causing it to lose its sugar and to resemble Madeira.

The subsequent operations consist in racking and fumigating with sulphurous acid every three or four months, and in clarifying the wine. It can only be bottled after having remained in the casks for two or three years; a short time after this, Sauternes wines can be used. If they have to be kept long, it is necessary for them to contain at the time of bottling, sufficient sulphurous acid to hinder oxidation and prevent their resembling Madeira, which would spoil them completely.

In the case of the Monbazillac wines, on the contrary, a brown colour, almost mahogany, and a pronounced rank smell and taste are the characters most prized in old and very liquorous wines. Sometimes the bottling does not take place till the wine has remained for 8 or 10 years in casks, owing to fermentation setting up again, liberal applications of sulphurous acid being powerless to prevent it.

It is also due to relative insufficiency of sulphurous acid, when liqueur wines of Anjou, which are usually bottled very soon, become gradually, and of their own accord, more or less sparkling. After ripening, if they preserve their liqueur character together with a slight effervescence or "pearly" appearance, these wines possess an assemblage of quite remarkable properties.

The Rhine wines, although they possess special qualities due to the varieties of vine and to the soil, yet resemble, to a certain extent, either the Sauternes or Monbazillac wines according to their sugar content and the amount of sulphurous acid with which they have been treated.

419 - The Ageing of Bottled Wines.

GAYON, U. and DUBOURG, E. Sur le vieillissement des vins en bouteilles. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1000, pp. 200-202, 1 fig., 1 plate Paris, February 13, 1913.

Oxygen plays a preponderant part in the evolution of wine; it is therefore clear that the latter ages more slowly the slower the air is in reaching the vessels which contain it. For a long while, wine makers have tried to hinder the access of air to bottled wines of good quality. More than a century ago, they tried to attain this result by using corks double the length of those now employed (Château-Lafite 1808). Later recourse was had to ground glass stoppers (Chateau Lafite 1820-1825), but these were given up on account of the difficulty of opening the bottles. Now-a-days, wine is kept in bottles of variable sizes and closed with cork stoppers. The following are some of the sizes used in the Bordeaux district: ½ bottle (0.67 pint); Frontignan bottle (1.31 pint); Magnum (2.64 pints or 2 bottles); Imperial (5.28 pints or 4 bottles) and Jéroboam (10.56 pints or 8 bottles).

Experience has shown that the larger the vessel used, the fresher and better the wine keeps, while, on the contrary, it ages perceptibly quicker in smaller bottles.

This is due to the fact that the cross section of the neck is about the same in all bottles. The following analyses, made in 1911, show that, other conditions being the same, the changes which take place in the composition of the wine are greater in small than in large bottles.

Léoville-Barton 1881.

	½ bottle	Whole bottle
Total acidity	3.83 gr.	3.72 gr.
Volatile »	1.07 »	0.95 »
Ethers	0.551 »	0.514 »
Deposit	27 mgr.	25 mgr.
Proportion of deposit to volume .	$\frac{27}{1} = 27$	$\frac{25}{2} = 12.5$

Pape Clément 1887.

	½ bottle	Bottle	Magnum
Total acidity	3.42 gr.	3.25 gr.	3.23 gr.
Volatile »	0.60 »	0.58 »	0.59 »
Ethers	0.408 »	0.364 »	0.316 »
Deposit	14 mgr.	28 mgr.	31 mgr.
Proportion of deposit to volume	$\frac{14}{1} = 14$	$\frac{28}{2} = 14$	$\frac{31}{4} = 7.7$

Malescot Saint-Exupéry 1893.

	½ bottle	Bottle	Magnum
Total acidity	4.20 gr.	3.98 gr.	3.75 gr.
Volatile »	1.26 »	1.24 »	1.18 »
Ethers	0.536 »	0.498 »	0.483 »
Deposit	130 mgr.	205 mgr.	380 mgr.
Proportion of deposit to volume.	$\frac{130}{1} = 130$	$\frac{205}{2} = 102.5$	$\frac{380}{4} = 95$

At the time of analysis, all these wines were in a good state of preservation.

Thus the relative deposit decreases with the increase in size of the bottle, the acidity and ether content are less, the flavour is less developed, in a word, chemical analysis here confirms the opinion of the taster: wine ages more slowly in large than in small bottles.

OTHER INDUSTRIES DEPENDING ON PLANT PRODUCTS

420 - **California Fruit and Nut Output.**

Daily Consular and Trade Reports, 16th Year, No. 27, p. 579 Washington, February 1, 1913.

The following comparative statistics are from the *California Fruit Grower*, and represent the output of that State in the leading fruit and nut crops. Citrus-fruit shipments were 46 394 cars (1) in 1910-11 and 40 290 cars in 1911-12.

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(1) The California Carload is of 24 000 lbs. (Powell-Wallschlaeger), *The Italian Lemon Industry*, p. 9. Los Angeles, 1913. (*Ed.*)

Canned fruit and vegetables	1909	1910	1911
	cases	cases	cases
Apples	69 975	76 830	65 300
Apricots	664 110	743 160	858 325
Blackberries	49 955	62 025	77 825
Cherries	181 935	195 195	198 805
Grapes	24 470	45 645	70 915
Loganberries	4 012	12 639	19 117
Nectarines	14	1	23
Pears	501 440	619 355	618 920
Peaches	1 436 160	2 145 450	2 091 125
Plums	89 425	80 360	165 840
Raspberries	3 590	10 126	3 625
Strawberries	10 580	14 073	7 715
Other fruit	1 335	3 690	5 115
Total fruit	3 037 001	4 008 549	4 182 650
Asparagus	410 965	617 275	687 065
Beans	12 435	46 250	65 820
Peas	104 010	167 775	184 775
Tomatoes	672 270	1 350 310	1 515 450
Other vegetables	43 050	69 035	63 545
Total vegetables	1 242 730	2 250 645	2 516 655

Nuts	1900	1911	1912
	tons	tons	tons
Almonds	2 710	1 450	3 000
Walnuts	5 430	12 500	9 250

Cured fruit	1907	1911	1912
	tons	tons	tons
Apples	3 300	3 500	3 500
Apricots	1 100	11 000	18 500
Figs	4 500	5 500	5 000
Peaches	15 500	14 000	27 000
Prunes	53 000	95 000	97 000
Raisins	75 000	65 000	85 000
Other	1 200	3 750	3 000

Wine	1911	1912
	gallons	gallons
Sherry	6 523 139	8 559 869
Port	9 164 671	9 522 238
Muscat	1 864 246	2 247 220
Angelica	2 123 824	2 609 519
Tokay	79 907	81 645
Malaga	337 503	327 173
Other sweet	136 835	119 782
Total sweet	20 230 125	23 467 446
Total dry and sweet	50 467 000	42 230 000

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS

421 - Legislation on Plant Diseases in the Colony of Mauritius.

KOENIG, P. — *Colony of Mauritius, Annual Report on the Forest and Gardens Department for* 1911, pp. 16-17, 1912.

In 1882, an Ordinance (No. 14 of 1882) was enacted in the Colony of Mauritius to prohibit or regulate the importation of vine plants or cuttings when affected or supposed to be affected with disease. The measure was passed at the request of the Government of the Colony of the Cape of Good Hope, to cooperate in prohibiting the importation of Phylloxera. No other legislation existed in Mauritius regulating the introduction of plants, fruits, manure, etc., except as regards protection from cattle plagues and animal diseases; against these the Medical and Health Department had been allowed a certain amount of control, chiefly after the outbreak of " Surra ", on importations of straw, animal manure and the like from countries where cattle plague was prevalent.

On the 30th June 1910, on the invitation of the Secretary of State for the Colonies, an Ordinance was enacted (No. 4 of 1910), to prevent the introduction into the Colony of diseases of plants. The law came into effect on the 19th of August 1911, by Proclamation No. 29, prohibiting the importation of certain produce like earth and leaf-mould, animal and vegetable manure, cattle fodder, timber with bark on, etc., and allowing the landing of other produce after inspection and treatment, if need be, by the Director of Forests and Gardens. It was advised to disinfect the suspected plants by means of fumes of hydrocyanic acid, but a fumigator has not yet been built. As a disinfectant, recourse has often been had to an emulsion of petroleum, soap and creoline.

During the service of inspection the presence was ascertained of *Hemichlonsaspis aspidistrae* Sign., *Parlatoria proteus* Curt., *Mytilaspis pallada* Green on Citrus plants coming from China, Madagascar, etc., and of *Hemichionaspis minor* Mask. on pumpkins coming from the Rodriguez.

422 - The Regulation of November 12, 1912, for the Transport of Vegetables in Uruguay.

Reglamentación para el transporte de vegetales — *Revista de la Asociación Rural del Uruguay*, Year XLI, No 12, p 921. Montevideo, 1912.

Art. 1. — No plant, or portion of a plant, can be transported in the territory of the Republic unless it is accompanied by the necessary certificate furnished by the "Defensa Agricola," or by the duly authorized proprietor, or official of the establishment from which it was despatched.

Art. 2. — The transport agents and railway officials must demand the certificate mentioned in Art. 1.

Art. 3. — Nursery gardeners and sellers of plants are obliged to request the examination of their products: if the results of the inspection show that the establishment is in a satisfactory sanitary condition, a certificate to this effect will be granted.

Art. 4. — This certificate will be valid for six months.

Art. 5. — The term fixed in the preceding article can be revoked any time that a subsequent inspection proves the existence of disease in the establishment, or whenever there is any infraction of the prescribed regulations.

Art. 6. — In every case where a new plant, or portion of a plant, which is being transported through the territory of the Republic is found to show symptoms of an infectious disease, all the responsibility falls upon the giver of the certificate mentioned in Art. 1.

Art. 7. — The amount of the penalty incurred is to be fixed for each case as it occurs, but shall not exceed the sum of £20.

Art. 8. — At least 10 days before the expiration of this certificate, the possessor is required to inform the General Direction of the "Defensa Agricola" of the fact.

Art. 9. — In the certificate mentioned in article 1 are to be specified the number and kind of products to be transported and the names and addresses of the sender and the receiver.

Art. 10. — The form of certificate is to be that appointed by the General Direction of the "Defensa Agricola."

423 - Order on the Control of Locusts in Spain.

Real orden disponiendo que por los Gobernadores civiles de las provincias que se mencionan se ordine à las Juntas locales de extinción de los pueblos invadidos por la langosta, la necessidad absoluta de que el dia 31 del actual se encuentren escarificados todos los terrenos que en sus respectivos términos esten acotados por contener germen de aquélla. — *Gaceta de Madrid*, Year CCLII, Vol. I, No. 16, p. 139 Madrid, January 16, 1913.

Art. 64 of the present law against the pests of agriculture (ley de Plagas del campo) of May 21, 1908, orders that the operations of cleaning the lands infested by locusts must be terminated by January 31. With the, object of reminding the authorities that the law must be rigorously observed the present Order has been issued. It provides:

1) That the civil governors of the provinces of Albaceta, Avila, Ba-

dajoz, Cáceres, Cádiz, Canarias, Ciudad Real, Córdoba, Cuenca, Huelva, Jaén, León, Madrid, Málaga, Salamanca, Seville and Toledo shall inform the local commissions for the destruction of locusts in the rural districts affected by them, of the absolute necessity of ploughing not later than January 31 all the fields which in the various communes are considered to harbour locusts' eggs.

2) That the Chief Engineers of the respective agricultural districts shall within eight days supply information as to the number of acres already ploughed and of those still unbroken.

3) That the above Engineers shall give their opinion on the probable state of the invasion at the end of the autumn and winter campaign in order to forecast the intensity of the infection in the coming spring, and on the efficient remedies for its destruction.

4) That when the proportion of locusts that may hatch in spring is known, the above mentioned civil governors, with their respective provincial councils of agriculture (de Fomento), shall order the local commissions to draw up the estimates of the expenses, in the form set forth by articles 70 and 71 of the Law. Should the Minister of Agriculture (Fomento) lack the funds required for the control of this pest, the above Law provides the necessary subsidies.

5) The above Ministry will prosecute contraveners of the law, availing itself of all the means at its disposal.

DISEASES NOT DUE TO PARASITES AND OF UNNOWN ORIGIN.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

424 - The Infectious Chlorosis of Citrus Trees.

TRABUT Sur la chlorose infectieuse des *Citrus*. — *Comptes-rendus hebdomadaires des Séances de l'Academie des Sciences*, 1913, 1st Half-year, Vol. 56, No 13, pp. 243-244. Paris, January 20, 1913

In orange-groves it sometimes happens that certain trees are attacked by a serious kind of chlorosis, which increases in intensity during the course of two or three years and causes the death of its victim. The chief characteristic of this form of chlorosis consists in its very clear transmission by grafting; for this reason the writer, who has already observed it for twelve years, suggests giving it the name of "infectious chlorosis". All slips taken from a diseased individual give rise to trees which are chlorotic from their second year; the stock itself becomes infected and dies from the same disease, even if the grafted portion is cut off. If this infected tree is grafted again, the disease spreads to the new graft.

According to the writer, two species of orange trees are especially liable to this malady: Washington Navel (coming from England, where it was grown under glass) and Siletta, of which grafts were sent from Australia; but it can make its appearance on other cultivated species of *Citrus*.

The diseased grafts grow vigorously the first year; in the second year they flower extraordinarily freely and bear an unusually heavy crop of fruit. Then the leaves begin to turn yellow along the midrib for a width of 3 to 5 mm. on either side. The discoloration afterward spreads to the lateral veins; the leaf has a peculiar appearance, the destruction of the chlorophyll continues, and soon the whole leaf loses its colour.

This disease, which seems not to have been described yet in America, is very similar to the "infectious chlorosis of the Malvaceae" of V. Baur (1906).

The writer states that in practice it is easy to prevent the trees contracting this malady, which he has proved by numerous experiments to be only communicable by grafting. As M. Trabut found no traces of bacteria, he admits for the present Baur's hypothesis, according to which the disease is caused by a phytotoxin secreted by an organism which has escaped microscopic investigations, but proves its presence by the inoculation results.

BACTERIAL AND FUNGOID DISEASES.

425 - The Contamination of the Soil by the Toxic Products of Parasitic Fungi.

FUNGI

PANTANELLI, E. Su l'inquinamento del terreno con sostanze nocive prodotte dai funghi parassiti delle piante — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, 1st Half-year, Part 2, pp. 116-120, Roma, 1913.

ID. Ancora sull' inquinamento del terreno con sostanze nocive prodotte da funghi parassiti delle piante. — *Ibidem*, part 3, pp. 170-174, fig. 1 Roma, 1913.

The aim of the writer was to discover if those fungi which attack the underground portions of plants under the natural conditions of parasitism can, during their lifetime, secrete sufficient toxic matter to permeate the soil and contaminate the latter for some distance from the part of the plant attacked, or whether these fungi leave toxic substances in the infected parts, even at their death, thus contaminating the soil for a certain length of time.

The first experiments were made in 1910; some sterilized wheat grains were germinated in contact with a raw or boiled infusion of *Septoria graminum* or with mould derived from wheat leaves attacked by this fungus, and also in contact with soil impregnated with the same unboiled infusion. Identical experiments were also carried out in 1910, with melon plants of which the crowns were infested by *Fusarium niveum* and with white mustard attacked by a species of *Pleospora*. An attempt was made, in the case of the mustard, to separate the toxic substances by precipitating the infusion with 30 to 45 per cent. alcohol. Similar experiments were made in 1911, when the base of the stem of beans attacked by *Sclerotinia Libertiana* and of lucerne infected with *Fusarium incarnatum* were selected.

The results were concordant and thus showed that soil, especially if it contains clay, can be impregnated with toxic products arising from the decomposition of vegetable organs infected by fungus parasites.

To avoid the objection raised, that by using entire infected organs in the previous experiments, it was impossible to be sure that the toxic matter was not derived from the cells of the host plant, pure cultures of *Sclerotinia Libertiana* were employed in 1911, and of *Fusarium incarnatum* in 1912; these were studied in connection with the germination of red clover and lucerne. In the case of the clover, the experiment clearly showed that the unboiled culture liquid (liquid gelatine) was much more injurious than mycelium juice (the mycelium was already old), and lost some of its toxic property on heating; 60 per cent. of its insoluble components were toxic; the volcanic sand (used as a substratum), being composed of coarse crystalline particles, did not absorb any of the toxic substances; while the loam soil retained the great portion of the latter in a form which was not accessible to the roots. The extremities of the roots were wilted, brown, or completely decomposed in some cultures, and had not been able to grow more than 263 mm. in length; in another culture, they were well developed where the seed had germinated deeply, but in seeds which had germinated at the surface they were withered and brown; this shows that the toxic substances remained in the upper layer of the soil. It appears, on the other hand, that the lucerne was stimulated by some substance present in the unboiled culture; but the boiled liquid slightly hindered germination. In any case, the roots of the first seeds which germinated were arrested in their development, and their extremities were discolored or destroyed in some of the cultures; the roots of the seeds last germinated were on the contrary quite healthy. This proves that the injurious substances had already undergone some change.

The effect of toxic preparations from *Sclerotinia Libertiana* was tried upon chickpea and lentil plants one month old grown on sterile volcanic sand. The mycelium juice produced no alterations; the neutralized unboiled culture liquid caused the death of the whole plant in one night, and if the liquid was heated to 100°C., the same effect was produced in two or three days.

In a second note the writer gives an account of similar esperiments to those made with a pure culture of *Scl. Libertiana*; these were carried out in 1912 with a culture of *Fusarium incarnatum* isolated from lucerne which was much damaged. This fungus also, according to the different experiments, elaborates toxic compounds of various kinds, amongst which, in the last analyses, volatile and stable nitrogenous bases predominated; these prevent the germination of the seeds and injure the roots of various Leguminosae.

It still remained to be seen whether these different fungi produce similar effects if the products are allowed to diffuse naturally in the soil. The first experiments made and carried out with suitable precautions with *Fus. niveum* on water-melons, *Scl. Libertiana* on beans and *Fus. incarnatum* on sainfoin and clover, proved that from the mycelia of these fungi and from their substratum, which under natural conditions would be the part of the plant attacked, toxic substances can permeate the neighbouring soil, so that they would hinder the growth of the roots, or prevent the germination of the seeds of similar plants.

426 - Researches on the Disease Caused by *Rhizoctonia violacea.*

ERIKSSON, JACOB. Études sur la maladie produite par la Rhizoctone violacée. — *Revue générale de Botanique*, Year 25, No. 289, pp. 14-30, figs. 1-4. Paris, 1913.

After a rapid review of the history of this disease and a description of its characteristics in Sweden, where it occurs especially on carrots and beets, the writer mentions, taking previous observations as a basis, that *Rhizoctonia violacea* attacks a large number of host plants, which are very varied from a systematic point of view. But in going into the matter more closely, it becomes clear that in a place where several species of plants are growing the disease does not attack all with the same intensity. This parasite has a certain tendency, though a slight one, to give rise to biological races. This can be proved (as was done by the writer during the summers of 1898 to 1902 and in the summer of 1911) by parallel inoculation experiments made with infections derived from different species of plants. By this means the writer was able to prove from two series of experiments, that the propagation of the disease by means of infectious matter derived from carrots and beets respectively was much easier and more effectual, if the subjects of the inoculation belonged to the same species as those which furnished the virus, and became increasingly difficult in the case of the other plants experimentad upon in the following order: *Stellaria media, Myosotis arvensis, Galeopsis Tetrahit, Erysimum cheiranthoides, Urtica dioica, Sonchius arvensis*, turnip, lucerne, potatoes; while others, such as clover and parsnip, are resistant to the infection.

Having recently re-examined the experimental material collected in 1898, Prof. Eriksson thinks (at least as far as the form of fungus attacking carrots is concerned) that the much debated question of the systematic position of the sterile mycelium known as *Rhizoctonia violacea* is now decided; its proper scientific name is *Hypochnus violaceus* (Tul.) Eriks. The fungus, during its vegetative period, forms upon the roots of many plants a felt-like mass of sterile mycelium, living as a parasite underground, of a reddish-violet colour and characterised by numerous confluent filaments which are septate and ramified. From this felt arise round sclerotia, dark brown in colour and resembling perithecia. This is the *Rhizoctonia* stage. Subsequently the fungus forms round the stems of the same plants, or of other species, and immediately above the soil, an annular membranous pale pink envelope, which often ascends the stems to a height of 5 to 15 mm., sometimes extending over the surface of the soil as a very thin sheet, and produces the basidiophores. This latter is the *Hypochnus* stage.

The name *Dauci* may be given temporarily to the species-form which has its *Rhizoctonia* stage on the bases of the stems of *Stellaria media, Myosotis arvensis, Galeopsis Tetrahit, Erysimum cheiranthoides, Urtica* *dioica* and *Sonchus arvensis.* Until further experiments and researches have been made, it is impossible to decide positively if the felted mycelium found on beets (*Rhizoctonia violacea* sp.-f. *Betae*), on clover, lucerne, etc., also possesses a *Hypochnus* form.

It is remarkable that the fruiting stage of the fungus (at least in the case of the sp.-f. *Dauci*) occurs on species of plants other than those infested by the sterile mycelium, and also that the fungus, which in the sterile stage is a pronounced parasite with much power of destruction, appears scarcely parasitic at all in its fruiting stage. The occurrence of the fruiting stage on species of plants other than those of the hosts of the sterile stage recalls the dioecious habit of many fungi of the rust family; in any case this *Hypochnus* stage requires further investigations.

In conclusion, the writer mentions the following methods for the control of the disease when it attacks carrots, beets and other roots:

a) At the time the crop is gathered, all stems showing the least trace of the disease should be destroyed, by cooking or otherwise.

b) The spots where diseased plants have grown should be marked by rings of sticks; the infected soil should then be treated with a fungicide, *e. g.* carbon disulphide (½ lb. in 10 gallons of water, 8 gallons being sufficient for 15 sq. yds.).

c) The roots which have been dug up from near the infected spots must be examined at intervals during the winter and all diseased ones destroyed.

d) A rotation of at least 4 years should be adopted, only such plants being cultivated as cannot possibly serve as hosts to the parasite.

e) The dung of animals fed on the contaminated roots must not be used as fresh manure.

427 – Researches on the Development and Control of Vine Mildew.

FAES, H. Sur quelques recherches concernant le développement et le traitement du Mildiou. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 99, pp 161-165. Paris, February 1913

It is well known that there is considerable difference of opinion amongst investigators as to the method of germination of the oospores of vine mildew (*Plasmopara viticola*) in spring. MM. Ch. Richon, Farlow and P. Viala believe that the oospores set free at a particular time zoospores which probably infect the vine in the same manner as the zoospores produced by the summer conidia. Others, M. Prillieux in particular, are of opinion that the oospores send out a germ-tube, which is modified later into a true conidiophore resembling the usual fructifications of the fungus which in summer project through the stomata of the leaf.

The writer, however, during the numerous researches and experiments which he made on the oospores of many vine leaves of the Chasselas variety gathered in the autumn of 1911, in no case saw any signs of a germ-tube, and was never able to infect the upper or lower surfaces of the leaves by means of oospores. The solution of the question necessitates further research, but the writer does not think that the oospores can at all readly germinate in spring and infect the vine.

During the summer of 1912, M. Faes made some further experiments on the infection of vine leaves and bunches of grapes by mildew conidia. As far as the former were concerned, these experiments confirmed his previous observations: the germ-tube issues from the zoospore and penetrates into the interior of the leaf by means of the stomata on its lower surface.

In the case of the bunches, the infection of the buds takes place by means of the stomata on the upper part of the petals. The writer obtained negative results in attempting to infect the flowers after the fall of the corolla. Grapes of the size of a pea could only be infected when the conidia were placed on the point of insertion of the pedicel in the grape, or on the pedicel itself.

In conclusion, the writer mentions that in 1912, all vines which were well-tended and sulphured were immune from the attacks of mildew. Comparative experiments proved that sulphuring the lower surface of the leaf in all cases protected the vines as well as sulphuring the upper surface. This subject, however, needs further investigation.

428 – *Sterigmatocystis nigra* damaging Tobacco in Hungary.

BACTERIAL
AND FUNGOID
DISEASES
OF VARIOUS
CROPS

RAPAICS, RAYMUND. A dohány kormos rothadása. — *Magyar Dohányujság*, Year XXX, No. 4, pp. 2-4. Budapest, February 20, 1913

During the last two years, a fungus disease which had not been recorded from other countries in Europe has been causing havoc in Hungary. The fungus is *Sterigmatocystis nigra*, known only in North America, where it is called canker or black rot. It attacks tobacco during the fermentation and decomposes the leaves, reducing them to a black powder.

In 1911, M. Étienne Uray, controller of the purchase of tobacco at Budapest, when buying tobacco for the Royal Excise Office of Hungary, discovered for the first time *Sterigmatocystis nigra* on the leaves. Subsequently the Experimental Station of Tobacco Cultivation at Debreczen made a chemical examination of the material and stated that this was the first time that the fungus had been observed to attack tobacco in Hungary. This new disease is the more dangerous in that the cause of the appearance of the parasite on fermenting tobacco leaves is not known, although the same fungus has been met with upon other decomposing substances.

The writer gives some information on the nature of the disease, and considers that the black powdery decomposition product of the leaves which are attacked is directly due to the fungus. No efficacious remedy has so far been discovered.

429 - A Disease of Tomatoes (1).

BROOKS, F. T and PRICE, S. R. in *The New Phytologist*, Vol. XII, No. 1, pp. 13-21 + 13 figs. London, January 31, 1913.

In October 1911 some tomatoes grown out of doors in the neighbourhood of Bristol were found to bear large diseased areas somewhat depressed below the surface of the healthy parts. On the diseased portions of the fruits were found a species of *Cladosporium*, a species of *Macrosporium* and a fungus with pycnidial fructifications. These fungi were, for the most part, indiscriminately mixed, but on some of the diseased areas most recently formed, only the fungus bearing pycnidia could be seen. It was thought, therefore, as was proved experimentally, that the latter fungus was the cause of the disease, the two others being merely saprophytes. At a later date, the same pycnidia-bearing fungus was found on tomatoes grown under glass in the neighbourhood of Cambridge and was observed for two seasons in succession on plots of out-door tomatoes; in the latter cases the lower part of the stem was the region attacked, the cortex being partially destroyed by the parasite, which was identified as *Ascochyta citrullina* C.O. Smith, the conidial form of *Mycosphaerella citrullina* Grossenbacher. The writers cultivated the fungus isolated from the fruit and the stem, and made inoculation experiments with the parasite obtained from the fruit and stem of the plant.

In one plot of out-door tomato plants in Cambridgeshire, the disease occurred two years in succession and, in view of the apparent absence of a perithecial stage in Great Britain, and of the fact that the tomato plant is an annual, it is not clear how the disease is propagated from one year to another. It is possible that the mycelium hibernates in the dead tissues of the affected plants and that portions of diseased plants, left on the ground instead of being burnt, are the means of reinfection, if the same plot is planted the following year. The disease attacked the out-door plants when they were nearly full-grown, and under these conditions was sporadic, only 3 per cent. of the plants being affected; there is therefore little fear of its becoming a serious pest to growers of out-door tomatoes. Massee has, however, pointed out that this fungus may cause a serious epidemic among greenhouse tomatoes.

In consequence of its virulence under these conditions, it is included in the list of pests scheduled by the Board of Agriculture under the " Destructive Insects and Pests Act ".

430 - *Botrytis cinerea.*

LAFFORGUE, G. Le *Botrytis cinerea*. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1001, pp. 245-254. Paris, February 20, 1913.

A general study of this now dangerous parasite of the vine. The writer deals with the biology, the effects (" Edelfäule ", " pourriture grise ") of *Botrytis* on grapes and states that the control methods hitherto adopted for the control of this fungus are inefficacious. Further researches are necessary.

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(1) See also No 1546, *B.* May 1911. (*Ed.*).

431 – *Uromyces hyalosporus* sp. nov., causing the Disease to the Shoots of *Acacia confusa* Merrill.

SAWADA KANEYOSHI in: *The Botanical Magazine*, Vol XXVII, No. 313, pp. 16-20, 1 fig. Tokyo, January 1913.

The " Sòshiju ", *Acacia confusa* Merrill, is one of the most useful trees in Formosa, where it is used for avenues and ornamental purposes; it also furnishes fuel and timber and is planted as a windbreak. Throughout the island there are nurseries of this tree, which is everywhere employed in the extensive afforestations. The young trees in the nurseries are, however, much attacked by a rust-fungus; this especially injures their shoots. When the latter are badly affected uredo-sori occur in great numbers (even as many as 50) on a phyllode; they often coalesce, forming large patches, and deform phyllodes and young twigs; the growth of these is hindered and death subsequently ensues. On large trees, both pods and phyllodes are usually affected.

The writer gives a detailed description of the agent of the disease, and as he considers it to be a new species, he proposes it shall be known as *Uromyces hyalosporus*.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

432 – On the Behaviour of the Seeds of Wild Plants in the Soil and the Poor Results in the Destruction of Weeds obtained by Cultivation.

MUNERATI, O. Sul comportamento dei semi delle piante spontanee nel terreno e sulla scarsa efficacia dei lavori del suolo per provocare la distruzione delle erbe infestanti. — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, First Half-year, Part 2, pp. 120-126. Rome, 1913.

The age of the seed has certainly much to do with the preservation of species. The writer observed, in the lower Valley of the Po, that within certain limits, most weed seeds germinate more rapidly the longer the time which has elapsed beeween the time of their ripening (and consequently of their falling to the ground) and the date at which their germinating power is tested. There are in every case some hard seeds, even when they are two years old and more. As a rule, it can be stated that the less rapidly the seed becomes ready to germinate, the more persistent is the species as a weed.

The seeds of leguminous weeds do not appear as a general rule to benefit by a variation in humidity, and other seeds remain indifferent; but there are certain species, such as false oat (*Avena fatua*), shepherd's purse (*Capsella Bursa-pastoris*), dock (*Rumexc rispus*), sage (*Salvia pratensis*), in which the germination of the seeds is greatly stimulated by alternations of damp and dryness. It is thus erroneous to judge of the behaviour of seeds in their natural habitat by their conduct in the germinator.

Even in years when the summers are very wet, the seedlings do not come up in much greater numbers than in dry years.

It is generally believed that seeds which are buried deeply by ploughing can preserve their vitality indefinitely. The writer has ascertained, by means of a series of experiments, that, at least in soil which was worked periodically, seeds buried 14 to 18 inches deep (the usual ploughing depth in breaking up the temporary pasture) were under as good germinating conditions as if they had been lightly covered with soil. Should these deeply-buried seeds not germinate, this is probably due to the fact that they would not have germinated even in the most superficial layer of the soil.

From these data the writer deduces:

1. Superficial working of the ground (including work which is done in summer after harvest) is of very little use in controlling weeds which are propagated by seed, (*a*) because a large number of seeds do not grow, even if they happen to be in the superficial layers of the soil, and are periodically exposed to light showers which keep the ground continually, or only intermittently, damp; (*b*) because seeds which are ready to germinate come up equally well if they are buried deep in ploughing.

2. The very frequent turning over of the cultivable layer of soil is for the same reasons of little use, for even where the working of the soil is the main feature of modern agriculture, weed control has not ceased to be of the greatest difficulty.

3. The practice of preventing weeds from ripening their seeds and letting them fall to the ground should not be regarded as one of many means of hindering the propagation of the most harmful species, but as the sole certain and efficacious method, besides being the most economical.

433 - **Noxious Weeds: The Canary Island Broom (*Cytisus canariensis* Steudel) in Tasmania.**

BLACK, R. A in *The Agricultural Gazette of Tasmania*, Vol. XX, No 12, pp. 488-490 + 1 fig Hobart, December 1912.

This leguminous plant is a native of the Canary Islands, where it is used, *e. g.* at Santa Cruz, as a hedge or garden plant. It grows in many parts of Tasmania and when left undisturbed soon takes possession of the land. It has already become a nuisance in Victoria, where it has been proclaimed a noxious plant in at least twelve districts.

The writer recommends that this plant should be prevented from spreading by pulling it up and burning it before it goes to seed.

Prof. Ewart points out that the foliage of this *Cytisus* appears to be slightly poisonous.

INSECT PESTS.

MEANS OF PREVENTION AND CONTROL

434 - The Simultaneous Destruction of *Colaspidema atra* and Lucerne Dodder by Calcium Cyanamide.

SOLANET, L.-E. *Destruction simultanée du Négril e de la Cuscute des Luzernes*, 30 pp. Montpellier (n. d.).

A succinct account of experiments made on a large scale, during four consecutive years, in the neighbourhood of Montpellier for the purpose of destroying simultaneously *Colaspidema atra* (1) and lucerne dodder, The author states that calcium cyanamide reduced to as fine and light a powder as possible and applied annually at the rate of 90 lbs. per acre, has so far proved to be the most efficacious remedy against both the beetle and parasitie plant, while at the same time, it in no wise interferes with the growth of the lucerne. As this small amount of cyanamide is difficult to spread uniformly, the writer suggests mixing it with other substances according to the following formula: cyanamide, 1 part; gypsum, two parts; wood ashes, 1 part.

435 - The Control of *Conchylis* in Switzerland in 1912.

FAES, H. La lutte contre le ver de la vigne (Cochylis) en 1912. — *La terre Vaudoise*, Year 5, No. 7, pp. 67-69. Lausanne, February 15, 1913.

In 1912, owing to the unfavourable weather of the previous year, there was a relatively slight development of *Conchylis ambiguella*. But on the other hand, *Polychrosis botrana*, which was introduced into Switzerland also with imported grapes, spread there very much.

The writer gives an account of his experiments in the control of the latter pest in the vine-growing districts of Yvorne. Nicotine (2) added to a copper wash (20 lbs. per 100 gallons) or to a solution of soft soap (20 lbs. nicotine and 20 lbs. soap per 100 gallons) gave encouraging, if not wholly satisfactory, results; the experiments will be repeated in 1913. Creosote did not prove efficacious. Amongst the various insecticides tried ("insecticide X•X", "Golaz", "Palaccio", "Glucine" and "poudre Milo"), the first of which the composition is a secret, gave more interesting results and will be used for further experiments.

In order to increase the already potent effects of treatments with a base of pyrethrum powder and soft soap, the writer made mixtures of soft soap, pyrethrum powder and nicotine, and of soft soap, pyrethrum powder and lysol, which he is going to test in the open.

In 1912, both in the laboratory and the vineyard, the writer had excellent results with a solution of soft soap and pyrethrum powder (water 100 gallons, soft soap 20 lbs.; pyrethrum powder 15 lbs). The remedy should be applied in cloudy weather, or any way at night, to the larvae while still very small (2 to 3 mm. = $\frac{1}{10}$ inch.). The best pyrethrum powder is furnished by *Chrysanthemum cinerariaefolium*; the flower heads should be gathered before flowering, dried and pulverised. With a view to the possible cultivation of this pyrethrum in the warmer parts of Switzerland, and thus obtaining the powder pure and fresh, M. Faes began, in the spring of 1912, making trials of sowing and transplanting in three different districts, using seed from various localities.

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(1) A Chrysomelid very injurious to lucerne in France, especially in the south. G. GUÉNAUX: *Entomologie et Parasitologie Agricoles (Encyclopédie-Agricole)*, p. 161. (*Ed.*).

(2) Probably tobacco juice containing 10 per cent. of nicotine. (*Ed.*).

436 - The Destruction of the Larvae of *Conchylis* and Aphides on Fruit Trees.

PETIT, A. Destruction des larves de la Cochylis et des Pucerons ordinaires. — *Journal de la Société nationale d'Horticulture de France*, Series 4, Vol. XIII, November 1912; p. 710 Paris, 1912.

The writer states that a simple aqueous solution of white soap, without the addition of any toxic substance, but made in the proportion of *at least* 10 lbs. per 100 gallons of *rainwater* is sufficient to destroy *Conchylis* larvae. The amount of soap must be increased as required should the water be hard. The solution should be applied only to the bunches of grapes and a sprayer must be used.

Further, a solution of 4 lbs. of Marseilles soap in 100 gallons of rain-water destroys, according to the writer, the aphides which commonly attack fruit trees.

INSECTS INJURIOUS TO VARIOUS CROPS

437 - Enemies of Barley.

NOEL, PAUL. Les ennemis de l'Orge — *Bulletin du Laboratoire régional d'Entomologie agricole*, Fourth quarter (Oct.-Nov.-Dec.) 1912, pp 5-7. Rouen, 1912.

List of the enemies of this cereal.

Coleoptera : *Melolontha vulgaris* L., *Agriotes lineatus* L., *Sitophilus* (*Calandra*) *oryzae* Fb., *Lema cyanella* L., *L. melanopa* Hbst.

Hemiptera : *Aphis cerealis* Kalt., *A. avenae* Fb., *Jassus sexnotatus* Flor., *Endeis* (*Aphis*) *bella* Koch.

Lepidoptera : *Agrotis crassa* Fb., *A. clavis* Rott., *Charaeas graminis* L., *Asopia farinalis* L., *Orobena frumentalis* L., *Gelechia cerealella* Oliv.

Diptera : *Phytomyza cinereifrons* Hardy, *Chlorops taeniopus* Meig., *Cecidomyia destructor* Say, *C. flava* Meig., an undetermined Cecidomyid, and *Oscinis tritici* Fb., L.

Nematoda : *Tylenchus devastator* Kühn.

Fungi : *Ustilago Jensenii*, Rostr., *Erysiphe graminis* D C, *Puccinia graminis* Pers, *Helminthosporium gramineum* Eriks.

438 - Cotton Pests in the West Indies.

BALLAU, H. A. Notes on Certain Cotton Pests. — *West Indian Bulletin*, Vol. XIII, No. 1, pp. 34-38. Barbados, 1912.

The flower-bud maggot (*Contarinia gossypii* Felt.) made its appearance in Antigua about the end of 1907, and in 1907-08 destroyed about half of the cotton crop. From 1910 to 1912 it did no damage or very little.

The eggs of the flower-but maggot are not known, but it is believed that they are deposited within the tissues of the flower bud, the maggots feeding on the stamens and pistils. As many as 43 maggots have been counted in one bud. When the attacked bud drops, the maggots make their way into the ground, where they pass the pupal stage and transform to the adult condition. The entire life-cycle probably occupies from 24 to 31 days. This insect has been reared from cultivated cotton, from wild or native cotton, and from wild coffee (*Clerodendron aculeatum*). Insecticides and direct remedial measures have given negative results. The occurrence of the flower-bud maggot seems to be associated with periods of more than ordinary dampness accompanied with cool nights, which conditions occur in Antigua towards the end of October. Therefore early planting has been advised.

During the last few seasons there has been a remarkable decrease in numbers of the cotton worm (*Alabama argillacea*), due to the action of natural enemies. The following species are known in the West Indies: — Egg parasites: *Trichogramma pretiosa* and *Telenomus* sp.; parasites of the larvae or of the pupae: the "fleshy fly" (*Sarcophaga trivittata*), Tachinid flies, *Chalcis annulata*; predaceous insects: *Polistes annularis* (called "Jack Spaniard" in St. Vincent and "wild bee" in the Barbados), *P. bellicosus* ("cow bee"), *P. fuscatus instabilis* ("Marabunta" or "Jack Spaniard"), *Calosoma calidum* ("fiery ground beetle"), etc., and insectivorous birds, the most useful being the Barbados Blackbird (*Quiscalus fortirostris*).

The black scale (*Saissetia nigra* Nietn.) was one of the most serious pests of cotton in Barbados in 1905-06 and in 1907-08. Since this time it has been almost harmless, apparently as a result of the enormous development of an insect parasite, *Zalophothrix mirum* Crawford. This is also parasitic on *Saissetia hemisphaerica*, *S. oleae*, *Ceroplastes*, etc. Good results have been obtained by collecting twigs of *Hibiscus* or other plants bearing parasitized scales and tying them to the branches of cotton plants attacked by the scale insect. The shield scale fungus (*Cephalosporium Lecanii*) is also a powerful destructive agent of the black scale, especially during the wet season.

439 – *Heliothrips phaseoli* sp. nov., Injurious to Beans in Texas.

HOOD, J. DOUGLAS. A New Genus and Three New Species of North American Thysanoptera. — *Psyche: a Journal of Entomology*, Vol. XIX, No. 4, pp. 113-118, plates 8 and 9. Boston, Mass., 1912.

A description is given of a new species of thrips (*Heliothrips phaseoli* sp. nov.), collected by Mr. C. A. Hart near Brownsville, Texas, where it was very injurious to beans in 1908. The beans became yellowish and the crop was greatly diminished. It was also found on a wild bean in Mexico, so that it is supposed that it is a native insect which has lately turned its attention to cultivated beans.

440 - *Hypolycaena philippus*, an Enemy of Pineapples at Sao Paulo (Brazil).

BONDAR, GREGORIO. Una praga do abacaxi (Estudo original) — *Boletim do Ministerio da Agricultura, Industria e Commercio*, Year I, No. 4, pp. 103-104 + coloured plate. Rio de Janeiro, 1912.

At Campinas (Saõ Paulo) the young and well developed fruits of *Bromelia Ananas* L. (*Ananas sativus* Schult), called "abacaxi" and "ananaz" in Brazil, are much injured by the larvae of *Hypolycaena philippus* Fabr., a butterfly of the family *Lycaenidae* (blues). The exterior of the fruits, while still attached to the plants, is deformed and there are blackish cavities inside (which greatly spoil the appearance and depreciate the value of the pineapples) made by the larvae; these perforate the fruit in order to reach the interior, where they live on the pulp and eject their excrement through the holes they have made; this collects on the surface in the form of soft white masses, which are easily distinguished from the gum which accumulates at times on the fruits. When once the fruits are attacked, they rot, or grow deformed; generally two cavities in a fruit are sufficient to render it useless.

Pineapple cultivation being an industry of great importance in Brazil, the spread of this pest might be very harmful. In order to prevent its propagation, the writer counsels the inspection of the plants, in November or December, preferably in the morning when the excrement of the larvae is fresh and more visible, and the following up of the existing hole in order to capture and destroy the invaders.

RUGGERI ALFREDO, *gerente-responsabile*.